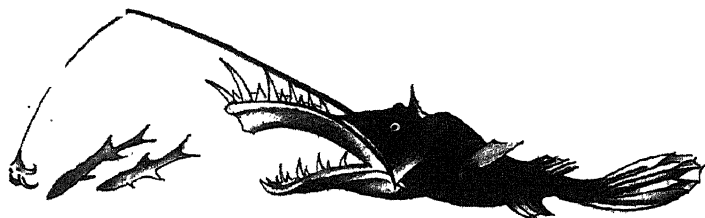


CURIOUS CREATURES

written and illustrated by

ERNA PINNER



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The illustration of the *Oropendolas* is based upon a study by Walter A. Weber, the *Bumble Bee and Honey Bee* on one by Hashime Murayama, and the *Ant and the Caterpillar* on a drawing by J. W. Frohawk.

FOREWORD

THE curiosities of the Animal Kingdom show Nature's love of play and design and her various inclinations and notions in a remarkable manner. This versatile and strange display which is of a special artistic interest has always fascinated me, and intensive travel has enabled me to observe in their natural surroundings many of the animals described and illustrated in this book. In watching some of the innumerable daily miracles of life I always felt generously rewarded and gratefully enjoyed the opportunity of finding a key to the significance of Nature's different manifestations.

I owe my deepest gratitude to George Ellard who has done all the editorial work and who showed a tireless interest in the proceeding of this book. Further I wish to thank my friend, Dr. G. M. Ververs, for reading through the typescript and for all his help and encouragement.

E. P.

Prais'd be the fathomless universe
For life and joy and for objects and knowledge curious.

WALT WHITMAN

CHAPTER I

THE STRUGGLE FOR FOOD

MANY creatures have, through force of circumstance or environment, developed or invented highly specialized methods of capturing their food and of dealing with it thereafter.

Spiders have curious ways of hunting their food and different spiders adopt different methods. Some spray gum over their victims to catch them, others leap upon their prey. Those which spin webs are very dissimilar in their habits and abodes: the Brown House Spider, for instance, spins its rather crude web in any room, while the Garden Spiders construct elaborate webs out-of-doors. There is, however, one feature common to all spiders and that is the fact that they kill their prey by means of poison injected into the victim through the spider's hollow fangs. This venom is toxic mainly to insects and it is only in the case of a few tropical spiders that the bite may affect human beings.

Spiders are a very large clan, comprising some twenty-five thousand described species. Although most numerous in the tropics they are known to range far into the Arctic regions; indeed they are to be found in almost all parts of the world where conditions are favourable for supporting life in any form. Spiders are not insects; they have eight legs instead of six, their bodies are divided into two parts, not three, and they possess a number of other distinctive characteristics which place them in the category known as Arachnids, a class which includes scorpions, mites and ticks.

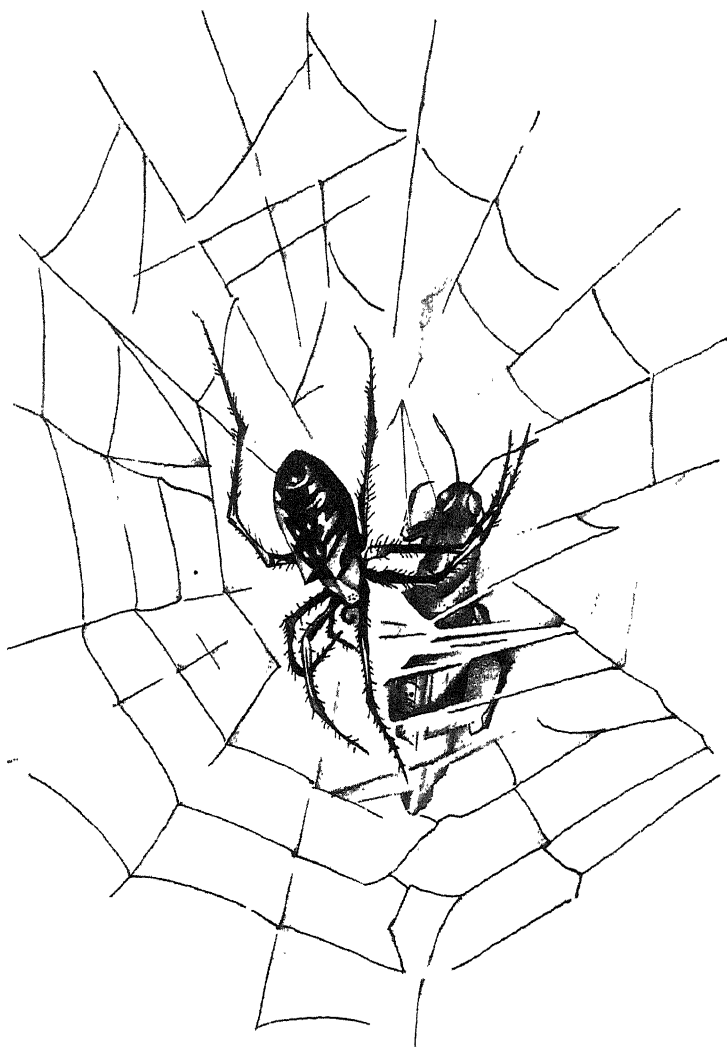
Many species of the vast spider family are provided with spinnerets which secrete silk. These spiders are extraordinarily good spinners and make protective shelters in which they lay their eggs.* The young spiders after a first moult escape from

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these sacs or cocoons, completely developed, as diminutive versions of their parents. Apart from the cocoons the spinnerets are also used in the construction of all kinds of webs which, although often of intricate design and no little beauty, serve mainly as snares in the capturing of food.

The illustration on page 11 shows the Golden Garden Spider, *Miranda aurantia*, of North America, with a grasshopper caught in her web. This particular spider weaves a large geometrical net over flowers in an almost vertical position. To avoid becoming entangled in her own silken trap she always carefully oils her legs. The body of the female is over an inch long; the male, far from typifying masculine supremacy, is barely a quarter of that length. Once the unwary grasshopper is caught in the web the brilliantly-coloured spider quickly binds her victim with silk from her spinnerets, so tightly that although still alive the creature cannot move. Next the grasshopper is injected with anaesthetic poison and the spider drains the juices from the body. Having completed her meal she severs the thread which holds the corpse to the centre of the web and the empty carcase falls to the ground. The male may then feed on what remains, the female soon returning to the web, where she waits motionless, head downward, for the next victim.

In contrast to the silvery web of the Golden Garden Spider the Trap-door Spiders excavate bottle-like tunnels in the ground. The Eastern Trap-door Spider, *Pachylomerus audouini*, lines her deep hole with fine silk and finally adds a wafer-type hinged lid which, covered with earth, resembles its surroundings. This lid the spider operates with her legs and, awaiting her prey, she will watch patiently for hours in the mouth of the tunnel, with the lid slightly raised. The unsuspecting insect victim nearing the tunnel sets up vibrations which warn the spider of its approach and at the appropriate moment she leaps out of the tunnel on to her victim, a movement so swift that the eye can hardly follow it.



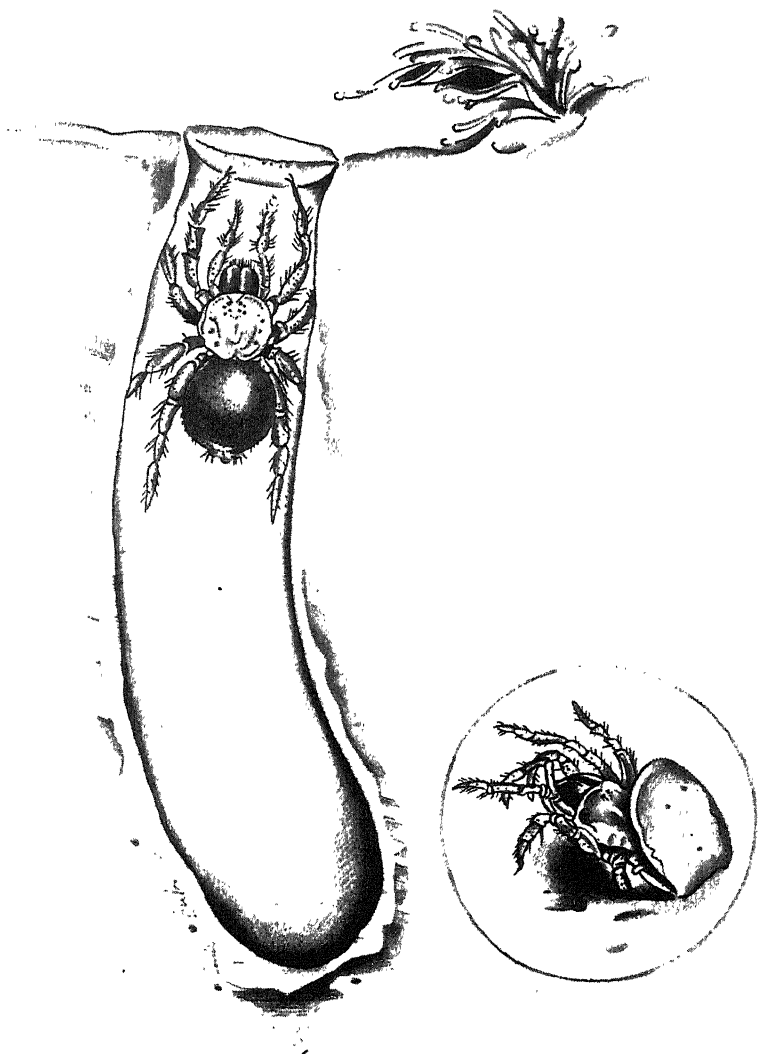
GOLDEN GARDEN SPIDER WITH A GRASSHOPPER CAUGHT IN HER WEB

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For more than ten years two American naturalists, F. E. Beck and Lee Passmore, have been gathering the common California Trap-door Spiders, *Bothriocyrtum californicum*, studying their solitary habits. They have added much new material to our knowledge of these little-known creatures. One of the most amazing features discovered by them is the enormous strength of the female Trap-door Spider in relation to her size and weight. When the rather massive door of her tunnel is shut the spider grips two small holes on the underside of the lid with her fangs and braces her legs against the side of the tunnel. In this position she is able to resist a pull on the door of ten pounds or more. The two enthusiastic research workers came to this conclusion as a result of the force they had to exert on the door when prying it open with a strong blade which would bend almost to breaking point.

Another observation of theirs of great interest is the discovery of the method of construction of the ingenious spring door which can be opened and closed by means of a broad hinge. This door, built by the spider with her fangs and mandibles, is in fact a cork-type waterproof covering made from damp earth with a spray of web over the edges and the underside; watching the making of the door Mr. Lee Passmore writes: 'At this point we began to wonder how the little worker would manufacture a hinge for her front door, but she soon solved the problem in simple fashion. She raised the partly-made door and bent it back to a vertical position. Naturally, it cracked in a straight line near the edge of the opening, but flexible reinforced webbing prevented separation from the inner side of the burrow. The fastening thus made was a hinge of amazing strength and durability.'

Protected by this trap-door, which is well camouflaged, the spider, ever alert and watchful, seems to know the right moment to raise the lid to spring out and capture her prey, as shown in the illustration. Then, dropping back to the bottom of the burrow which may be as much as nine inches long, she feasts



EASTERN TRAP-DOOR SPIDER AND COMMON CALIFORNIA TRAP-DOOR
SPIDER

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on all kinds of insects. To avoid being locked out of her home the spider takes care always to leave her hind legs and part of the abdomen under the open door, for this door fits so tightly into the tube that it is most difficult to re-open it from the outside once it has snapped shut. There is still a lot more to be learned about this fascinating Californian spider and the even lesser-known male, and who knows what curious habits may come to light?

Many birds have a hard struggle for existence, especially those which live on insects and have to fly thousands of miles each year to find sufficient food. Fish-eating birds, too, have to expend great energy in their efforts for survival and have evolved numerous different methods of submerging in search for food. Among the most formidable divers are Cormorants, which are to be found in most parts of the world. Some societies always live by the sea, others keep to the rivers, lakes and swamps. All have dark feathers on the upper parts of the body, giving a black appearance from a distance although the plumage may actually be of dark green or dark blue metallic hue. Whether fishing, sitting on the rocks drying their feathers, or flapping heavily back to their nests with food for their young, they are easily recognizable by the bottle-shaped body and long, slender neck which, in flight, is stretched out to its fullest extent. Unlike many sea birds they make a nest of twigs and seaweed, and they feed their young by regurgitation until such time as they can fend for themselves and are big enough to swallow a whole fish.

The Cormorants of the Old World, *Phalacrocorax carbo*, illustrated on page 15, inhabit the coasts of Europe and breed on cliffs and rocky islands. They generally obtain their food by diving, with closed wings, from the surface of the water, using their webbed feet as paddles, but they may also jump from a rock in order to gain impetus. Cormorants are able to remain under water for a considerable time and, using their feet for



CORMORANT DIVING

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swimming, they can achieve a great speed in pursuit of their prey.

This method of catching fish is not always to the advantage of the birds themselves. All the world over man has made use of the natural abilities of animals, adapting them for his own purposes, and the Japanese and the Chinese have enlisted the aid of the Cormorants for fishing. They employ trained birds, each of which has a ligature tied round the neck to prevent the captured fish from being swallowed, and usually set out on their fishing expeditions at night with flaming torches to attract the fish. Each member of the crew is responsible for a flock of a dozen birds and he pulls the birds back on board when their gullets are full and forces them to disgorge their catch. In spite of this the Cormorants, never despairing, always dive back in the water for more.

From China and Japan let us move across the Pacific to the Peruvian coast. There the Cormorants provide an even greater benefit to man. Entirely confined to the desert-like shores of the ancient country of the Incas, the Peruvian Cormorant, or Guanay, is to be found living in vast colonies, some colonies consisting of as many as a million birds. These Cormorants have been here for generations and in the course of thousands of years have produced the world's most precious and potent manure, Guano. In the very dry climate of this region the droppings of these huge colonies of Cormorants do not get washed away but accumulate on the nesting grounds, covering shores, rocks and coastal craft with a thick layer of Guano. Although fully aware of the enormous value of this material, when I visited one of the remote guano islands the overwhelming smell so sickened me that I had little opportunity to appreciate the fantastic congregation of white-breasted birds responsible for the production of the manure.

Some birds of prey hunt by day, others by night. One of the most fierce of 'the shadowy birds of the night' is undoubtedly the Great Horn Owl, *Bubo virginianus*, sometimes called the



B C.C.

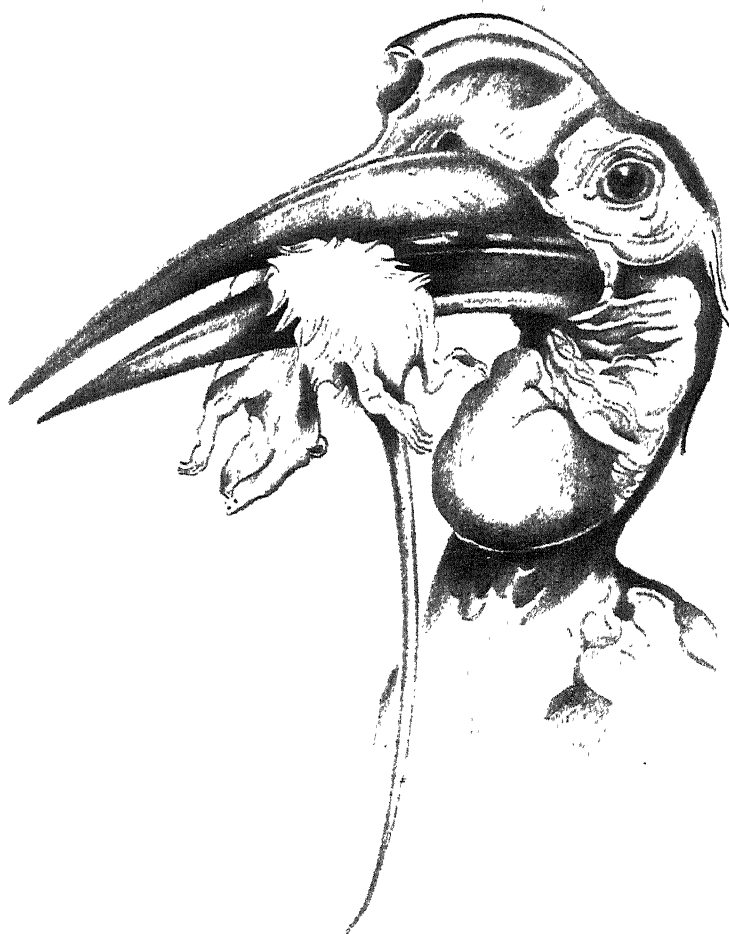
GREAT HORN OWL

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Cat Owl on account of its cat-like ear-tufts and eyes, but called by Ernest Thompson Seton, the famous naturalist, 'Winged Tiger' because he considered it to be the most pronounced and savage of all birds of prey. It is to be found throughout the Americas and has a wide range, being able to live under many different conditions.

The Great Horn Owl is bigger than any owl known in the British Isles and sometimes grows to a length of as much as twenty-five inches with a wing span of anything up to five feet. Like all owls it has a soft plumage with long, fluffy feathers, beautifully marked in variegated shades of brown. The wing quills have softened edges which makes the owl's flight soundless so that it pounces on its victims without warning. In choice of food it is both bold and predatory. It feeds on almost anything that walks, crawls, flies or swims, and any bird or mammal not too large is subject to its attack. This owl kills rabbits, hares and ducks with ease and occasionally even cats, snakes, porcupines and skunks. It is somewhat similar in appearance to the European Eagle Owl which occasionally visits the British Isles, and like its ferocious relative it never strikes with the beak but seizes and carries its victims off with its talons. The Great Horn Owl frequents dense woodlands of conifers or hardwoods, coming into the open only on its hunting expeditions at night. The hearing is acute and it has very large eyes, perfectly adapted for vision in the dark, which are protected by a second transparent eyelid from damage during flight by projecting twigs and other obstructions. The owl, however, can look only straight ahead and not outward as is the general case with birds; consequently the whole head has to be turned to change the line of vision.

Few birds have been more widely misrepresented in literature than owls. For centuries they have been looked on as birds of ill-omen, although their looking straight ahead has long symbolized wisdom and true knowledge—for instance reference is made in Homer to the great and wise 'owl-eyed' Athene.



AFRICAN GROUND HORNBILL

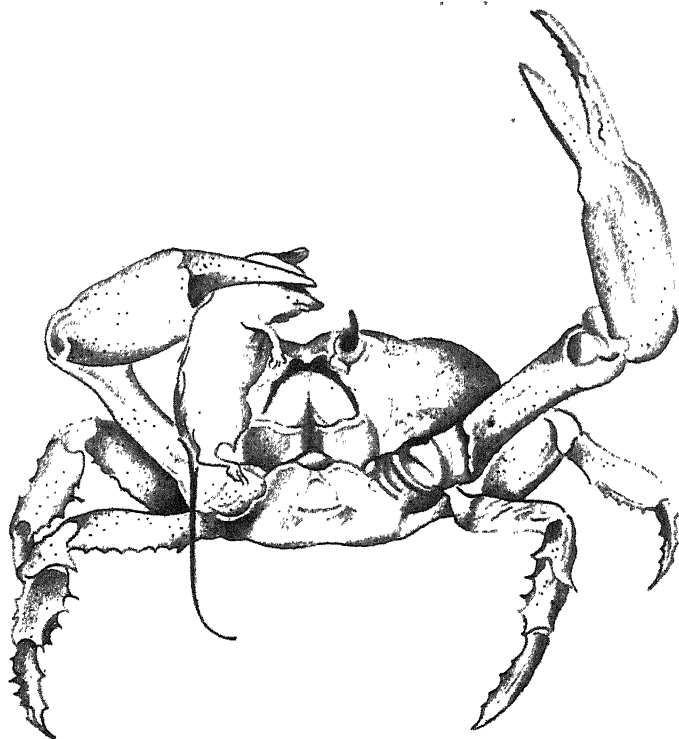
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Like the owls, most hornbills are arboreal, but the African Ground Hornbill, *Bucorax abyssinicus*, is equipped for life on the ground, feeding mainly on insects, rats and lizards. Like all other members of the hornbill family the main characteristic of the Abyssinian Ground Hornbill is the grotesquely exaggerated development of the beak which is hollow and is provided with a nasal protuberance or casque, looking rather like a helmet and open in the front. The Ground Hornbill is a large bird, over three feet in length, with black plumage but with the bare parts of the face red except for a blue surrounding to the eyes. The powerful feet are large and the legs much longer than those of its relatives. Though rather ungainly, it is fearless in its fight for food and is quite adept at killing snakes, protecting itself by folding the wings close together to form a shield for its head. Looking at the illustration of the Ground Hornbill the reader may feel a certain amount of pity for the luckless victim; but in so many forms of life in Nature survival depends upon such killing and when animals kill each other it is usually done very quickly. So far as the rat is concerned it is probably a less unpleasant end than being caught in a trap.

Another animal which has equipped itself for life outside the element normal to its 'family' is the Land Crab. The crabs found around the coasts of Great Britain generally live in shallow waters and rock pools, but in the tropics some crabs have adapted themselves to life almost entirely above high water level and return to the water only for breeding purposes. This change from sea to land existence must have taken a very long time since it necessitated a change in the breathing organs, a transition which could not have been effected quickly.

The Land Crab lurks, well hidden, in holes on the mud flats and among the roots of mangroves. When on the look-out its eyes project like periscopes above the ground, but when it is at rest these long eye stalks lie in shallow depressions along the front of the shell. Usually it is very much on the alert and

THE STRUGGLE FOR FOOD

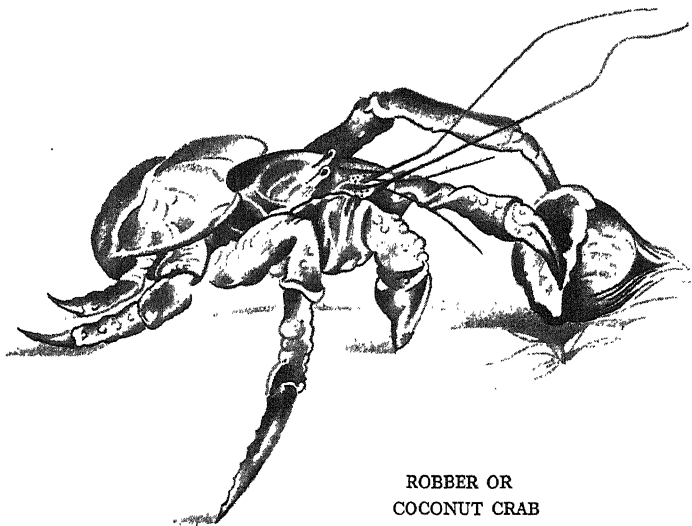


LAND CRAB OF WEST AFRICA

ready to pounce on any living thing coming within reach. As Land Crabs grow old the males develop enormous claws. The species shown in the illustration as having caught a mouse is a native of West Africa.

The detached limbs which are found when these creatures are kept in captivity testify to the frequent battles they have to wage. The animal has, however, a remarkable gift of regeneration and the limbs are eventually replaced. Every crab which loses its claws or legs casts off the stumps at special joints and goes around crippled until the time comes to change its shell.

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ROBBER OR
COCONUT CRAB

After this moult — in which the crab, having grown too large for its shell, sheds its complete outer covering — it reappears with a new set of limbs. These newly-grown limbs are not of normal size until several changes have taken place.

Yet another crab which has become terrestrial and does not need to go to sea except to spawn is the Robber Crab, *Birgus latro*, sometimes called the coconut crab. The Robber Crab is widely distributed on small tropical islands of the Indian and Pacific Oceans. In general appearance it is not unlike a huge Hermit Crab, but as its abdomen is bent under the thorax which is covered with horny plates it does not carry a mollusc shell for protection. The size and strength of a large crab are remarkable. A fully mature adult weighs between five and six pounds and measures, from the tip of the first pair of walking legs to the hinder end of the carapace, nearly three feet.

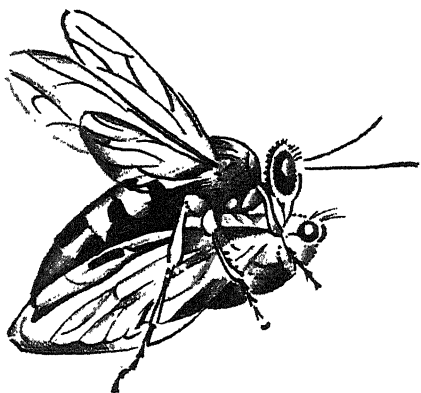
The most extraordinary feature of this animal is its habit of climbing palm trees. With its powerful claws it is able to open large cracked or damaged coconuts, feeding voraciously.

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ciously on the fleshy kernel which seems to be a favourite part of its diet. In a recent publication C. A. Gibson Hill states that, contrary to the general belief quoted in numerous published works, Robber Crabs are not able to open undamaged nuts. He kept Robber Crabs in captivity and several times tried to force a crab to open such a nut. In all cases he was unsuccessful. On Christmas Island three large crabs went without food for periods ranging from three to six weeks as a result of their failure to open undamaged nuts.

We do not know how long it took the Robber Crab to acquire the novel habit of climbing trees, but it probably required generations of experiment before tree-climbing became part of its normal routine; certainly it shows a resolute and intelligent response to drastically changed conditions.

There are some insects which use poisonous stings to paralyse their prey so that it can be easily carried away. The picture on this page illustrates one of the minor tragedies which are commonplace in Nature. A cicada has been surprised by a Burying or Digger Wasp, *Sphecius speciosus*, which preys solely on cicadas, and has been stung, not to death but into a state of complete helplessness. Later the cicada will be carried away into the wasp's burrow where it will be stored, still alive but paralysed, in an underground cell. There the wasp lays her egg on the body of the cicada and seals the cell with earth. After three days the egg is hatched and the grub



A CICADA PARALYSED BY A
BURYING OR DIGGER WASP

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BURYING OR SEXTON BEETLES BURROWING UNDER
THE CORPSE OF A DEAD BIRD

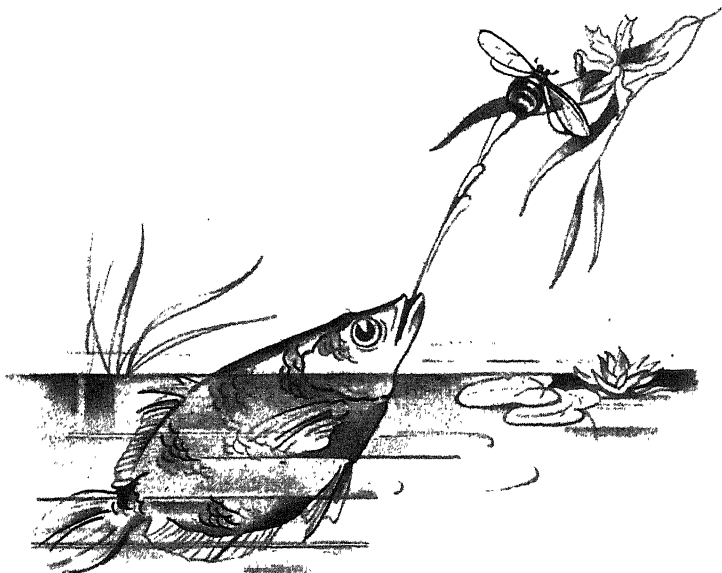
feeds on the fresh flesh of the cicada until it makes a cocoon in which the grub remains during the winter, passing, in the spring, through the pupa stage and eventually becoming a wasp which, digging its way out of the cell, repeats the whole thing to produce the next generation of wasps.

On the other hand the Burying Beetles, *Necrophorus*, make use of the carcasses of already dead animals such as mice, moles and birds to secure food for the next generation. Seven different kinds of these beetles, also known as Sexton Beetles, are to be found in Britain, and they depend on their keen sense of smell to find the dead animals. The burial is carried out by a group of the adult beetles burrowing under the corpse so that it sinks into the ground to be covered by loose earth. Most of the digging is done with the legs, with the head being used to shovel the earth away. Once the burial is completed the female beetles lay their eggs in the carcase. These hatch into larvae which feed upon the moist, rotting flesh and develop in due course into Burying Beetles which will carry on the cycle. In utilizing

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decaying animal matter the Burying Beetles present a striking example of economic reassimilation in Nature.

A number of species of fish have resorted to the practice of leaping bodily out of the water to get their food, but the Archer Fish, *Toxotes jaculator*, a fresh water form of Asia has an even more original method of capturing its prey. It swims close to the surface and waits until a tempting insect settles on some overhanging twig or perhaps flies overhead, then, pushing its mouth upward, it shoots a jet of water straight at its quarry which, battered and wet, falls into the water where the fish quickly disposes of it. Squirting these jets of water surprisingly accurately, the Archer Fish obtains insects that would otherwise be out of its reach. These fish vary in length from three to eight inches, the larger specimens being able to shoot a distance



ARCHER FISH SHOOTING AT AN INSECT TARGET

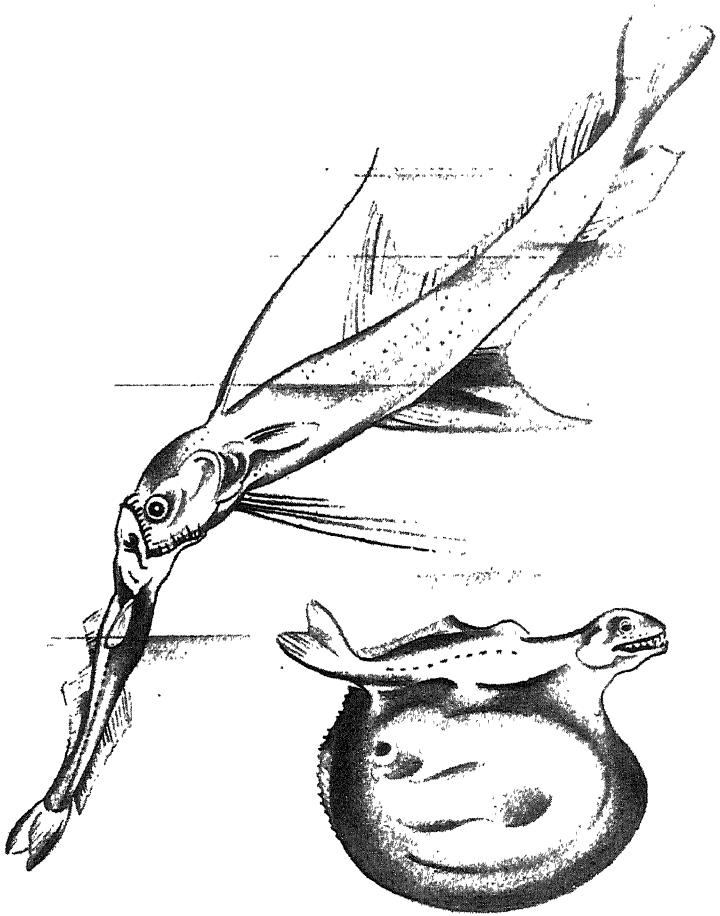
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of no less than twelve feet. Several of these fish have been kept in aquariums where they have been known to shoot at food held by hand over their tanks and also, when hungry, to attract the attention of their keeper by squirting water at him as he passes.

One has to move from tropical waters to the dark and icy depths of the Atlantic Ocean to meet one of the carnivorous fish of this lightless world. The unknown depths of the oceans have always exercised the human imagination and in a thirteenth-century French manuscript there is a painting showing Alexander the Great as a diver. The greatest ambition of Alexander was to conquer new worlds but legend has it that he was also the first man to go deep into the ocean merely to look at the fish. Some versions of this legend speak of a monster that took three days to swim past his glass cage.

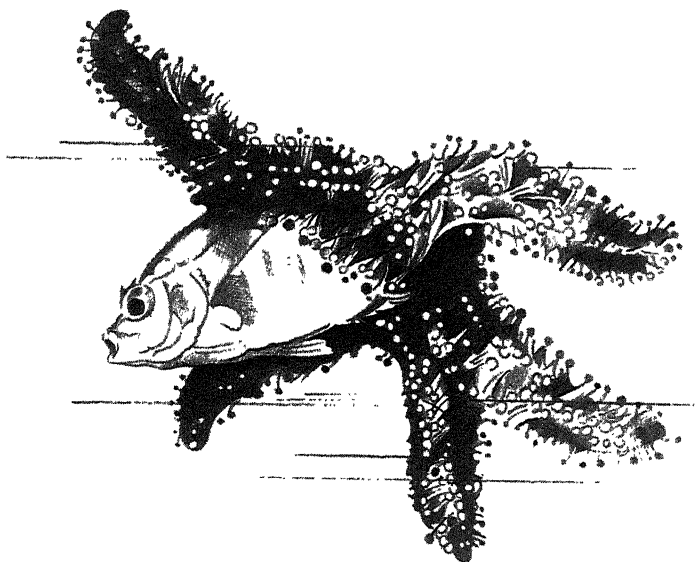
In our own time Dr. William Beebe, the famous oceanographic naturalist, has successfully carried out several deep sea investigations in his bathysphere, down to a depth of half a mile. So far he has not seen the great monster of the Alexandrian legend, but he has discovered many fantastic inhabitants of this mysterious world. Only very recently more attempts have been made to go down deeper still into the ocean to search out the secrets hidden in this dark underworld where luminous fish provide one of the strangest lighting systems known to man.

All fish in the oceans depend upon each other, on prawns and other sorts of small animal life for their food, and consequently have developed some extraordinary characteristics and habits, the largest not always being the mightiest. For instance, the Black Swallower Fish, *Chiasmodon niger*, of Bermuda, illustrated opposite, although not as large as a herring can swallow a fish three times its own length, the stomach conveniently stretching to accommodate the catch. With this amazing swallowing ability the smaller Black Swallower can overcome its giant opponent, a Unicorn Fish, of which only a curled shadow can be seen in the distended stomach.



A BLACK SWALLOWER FISH MAKES A MEAL
OF A FISH THREE TIMES ITS OWN SIZE

CURIOUS CREATURES



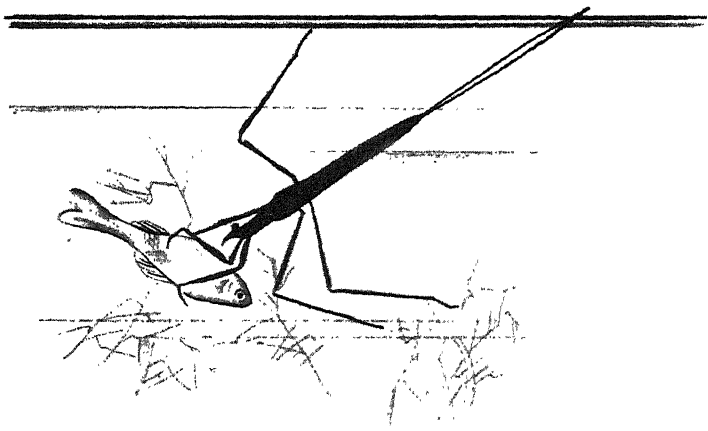
A BUTTER-FISH CAUGHT IN THE MAW OF A STARFISH

Starfish, *Astroidea*, belong to the group known as Echinoderms, 'hedgehog-skinned' animals. They have hard, spiny skins and on the underside of the rays or arms are rows of numerous slender, tubular feet with which these creatures move. These sensitive feet are equipped with suckers on which the Starfish depend for catching their food. They are ruthless hunters, raiding mussel and oyster beds in great numbers. The illustration shows a common five-finger Starfish having caught a Butter-Fish. Struggle as it may the Butter-Fish cannot dislodge the hundreds of cruel suckers and the Star Fish will, with the help of digestive juices, gradually absorb its live meal tail first. In doing so it literally turns its sack-shaped stomach inside out through the mouth and wraps it round its victim. Being such greedy feeders the Starfish sometimes lose an arm

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in the unrelenting struggle for food; but in a few weeks a new one will be grown and they will be none the worse for their adventure. Their capacity for regeneration is astonishing and even if some specimens are pulled to pieces each of the five arms, or fingers, will grow into a perfect Starfish in due course.

Leaving the sea for the comparative tranquillity of shallow stagnant ponds we find yet another hunting ground for a great variety of predatory animals. The Water Stick Insect, *Ranatra linearis*, is shown in the illustration attacking a Bitterling beneath the water. It has just captured the small fish with its fore legs and, having little chance of escape, the victim will probably be sucked dry by this blood-thirsty insect. Like a great number of water insects it has to come to the surface to breathe, and the tip of its special air tube sticks out of the water while the rest of the body is submerged. Water Stick Insects are found in many of the ponds of southern England, well camouflaged among submerged vegetation. Yellowish in colour they have extremely elongated bodies, one and a half inches long, with thin legs like those of the Crane Fly.



WATER STICK INSECT ATTACKING A BITTERLING

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SMOKY JUNGLE FROG SWALLOWING A SNAKE

The Smoky Jungle Frog, *Leptodactylus pentadactylus*, from the dense jungles of South America, is for its size a most voracious creature. It is to be found lurking in pools in tropical caves and in appearance is somewhat similar to the Bull Frog, with a broad head, large protruding eyes and a stout, burly body. Weighing about one pound, it will attack almost any living creature of its own size, using its muscular tongue to overcome bats, rats, small opossums and snakes. Kenneth W. Vinton, Science Instructor at the Christobal High School, Panama Canal Zone, kept a Jungle Frog in captivity for two years. He records the extraordinary appetite of this amphibian and gives a vivid account, illustrated with X-ray photographs, of an amazing episode when 'Smoky' swallowed a green tree snake four and half feet long. After shooting his tongue against the snake's head, the frog snapped the reptile's head into his mouth and, for two days, proceeded to eat his way along the snake, pausing from time to time with an almost philosophic calm for the digestive juices to do their work and make room for the end of the meal. Before it was suffocated the snake thrashed about fiercely, coiling its body round the frog. As Mr. Vinton says, however, there was little doubt about the outcome of the

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struggle, for even a snake cannot live for long without air and with its head in a frog's mouth.

There are, in fact, nearly two thousand known species of frogs scattered over the Earth. There are giant frogs, pygmy frogs, climbing frogs, burrowing frogs, hairy frogs, horned frogs — and all have adapted themselves in one way or another to the various conditions under which they have to maintain their existence. It would, nevertheless, be true to say that most frogs catch their prey by shooting out their sticky tongues.



JAVAN FROG

CURIOUS CREATURES

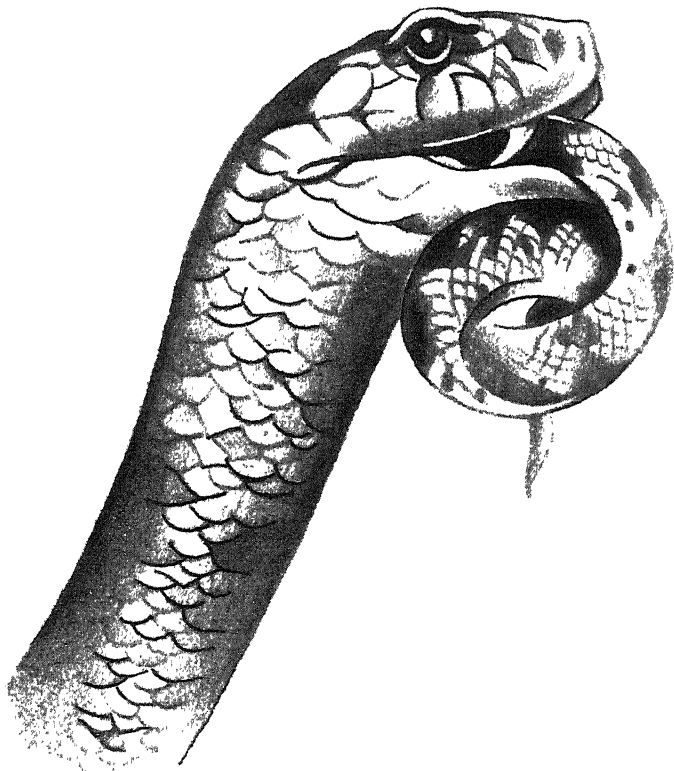
The illustration on page 31 shows a Javan Frog, *Limnodytes erythraeus*, catching an insect. The tongue of this frog, which plays such an important part in the capture of food, is soft, fleshy and lubricated with a glutinous saliva. The normal order of things as we understand them is reversed in the case of the frog's tongue. Instead of the tongue being rooted in the throat with the tip of the tongue in the front part of the mouth, the frog's tongue is attached to the inside of the lower lip with the tip dangling down the neck. When the frog wants to catch an insect the whole contraption moves in a semi-circle, the food is caught with the tip of the tongue and is tossed into the mouth and thence to the stomach as the tongue reverts to its normal position. This impressive act is carried out with the utmost rapidity, and frogs are mainly dependent on it for their food.

In contrast to the frog, the snake does not use its tongue to capture its food, nor does it, contrary to popular belief, use its tongue to sting. The snake's tongue is a sensitive vibrating organ which is used for feeding, smelling and touching. It is long and slender, ending in two threadlike points.

All snakes are legless, have no external ear openings and possess no movable eyelids. The eyes are protected by transparent horny discs which are part of the snake's skin and are shed with it when the snake grows a new one. This lack of movable eyelids is the reason for the typical fixed, stony, unblinking stare usually associated with these reptiles.

Snakes have evolved a very special way of moving about the ground. They have an enormous number of ribs which extend almost the whole length of the body, and each of these ribs has a muscular connection with the broad, horny, overlapping plates which cover the underbelly. By bringing these plates forward and then pushing them back against the unevenness of the ground the snake can glide along at a great speed. This locomotion of the snake is one of the most remarkable phenomena in animal mechanics.

THE STRUGGLE FOR FOOD



KING COBRA OR HAMADRYAD SLAYING A SNAKE

It is the custom of all ordinary snakes to swallow their prey whole, stretching the mouth to an enormous extent if necessary. This is possible because the jaws of snakes are formed of two almost straight bones joined in front by an elastic ligament capable of both extension and contraction. Fitted in this ingenious way snakes can attack and swallow large animals, accommodating the mouth to the morsel and not the other way about.

There are many kinds of poisonous snakes, such as adders,

CURIOUS CREATURES

vipers, cobras and kraits, and they are all equally lethal to animals, even those much larger than themselves. The King Cobra or Hamadryad, *Naja hannah*, of the Malay States, is the largest of all poisonous snakes and measures up to sixteen feet in length. The coloration of an adult King Cobra is yellowish-brown with black cross-bands. This snake belongs to the 'hooded clan' of cobras which all belong to the family *Elapidae*. Their distribution and variety is tremendous and their best known characteristic is the hood which can be raised under the stimulus of excitement. This hood is a loose portion of neck-skin and can be extended by ribs elongated for this purpose, but no cobra has the hood extended all the time and when it is at rest the ribs are folded back and no sign of the hood remains.

The King Cobra is considered to be one of the most dangerous animals in the world. It is cannibalistic in habit, feeding on other snakes, and its bite is invariably fatal to man. The venom is injected into the victim through a pair of long fangs such as all poisonous snakes have in the upper jaw. These fangs are hollow, like hypodermic needles, and are attached to poison sacs on either side at the back of the head. When the snake strikes, the sacs are opened by pressure and supply the fangs with the deadly poison. If the fangs get broken new ones grow in their place. The Hamadryad is a magnificent example of a highly developed and specialized animal, typical of the natural law 'Eat or be eaten' in the struggle for food.

NEST BUILDING

THE story of Phoenix, the fire-bird, rising from its cradle of flame and ashes may not have much foundation in fact, but it is true that innumerable creatures are born and are reared in very strange cradles and surroundings on land and on or under the water. In this chapter I shall deal with some of the extraordinary methods adopted by different creatures to provide the homes in which their young may be born and nurtured.

Although spiders are essentially air-breathing animals a few species have acquired the remarkable ability to go and to remain for long periods under water. One of these is the Water Spider, *Argyroneta aquatica*, an interesting inhabitant of many ponds in Britain, which spins a hollow bell-shaped nest under water, anchored by elastic silken threads to all kinds of water plants. Having completed this nest, which has the opening at the lower end, the Water Spider must provide air if it is to be able to live there. This it does by going up to the surface, bringing its hairy body into contact with the air, and collecting air about itself in the form of a large bubble which it holds to the abdomen with its hind legs. The air bubble is carried down to the nest and released in the opening, the air rising automatically to the top of the nest. This is done many times until the nest is full of air. Having achieved the essential breathing conditions, courtship, mating and egg-laying take place within the bell and the young Water Spiders grow to maturity in a separate nursery at the top of the nest without the necessity of acquiring temporary gills.

The Water Spider spends most of its life in the nest, resting by day and doing its hunting for food by night, food consisting

CURIOUS CREATURES

of all kinds of water insects. It takes great care to keep its fine hair-coat clean since this plays such an important part in its existence, transferring air from the surface to the nest. Spiders whose coats have become fouled and sticky with all kinds of algae and moss have been observed trying and failing to collect air bubbles. Their fate was certain.

Simple and modest as the construction of the nest of the Water Spider may be it is, nevertheless, an example of engineering perfection beside which man's attempt to make diving bells is both complicated and clumsy.

In contrast to the Water Spider, the Small Spotted Dogfish, *Scyliorhinus canicula*, does not build an actual nest, but deposits its eggs in curious oblong horn cases, yellow in colour, which are known to many, who have picked up the empty cases on the sands, as 'mermaid-purses'. These egg cases have long curled tendrils at the corners by means of which they are fastened to branches of seaweed or to rocks. They are almost transparent and on occasions the young fish can be seen inside the case, attached to the yolk sac upon which it depends, until it is hatched, for its nutrition.

The Small Spotted Dogfish is fairly common in all waters around the British Isles and the continent of Europe. It belongs to and can be identified in general anatomy with the shark family, the rough skin known as shagreen when dressed being used for polishing as is that of some of the larger sharks.

Most birds build nests, in trees, hedgerows, cliffs, the eaves of houses and other buildings, and even on the ground. There are some, however, who have rather strange nesting habits. For instance, the Elf Owl, *Micropallas whitneyi*, probably the smallest owl in the world being not much larger than the common sparrow, does not itself build a nest but lives about fifteen feet up in an old Woodpecker hole in the trunk of a giant saguaro cactus. The nest, which has been dug out by the Woodpecker, is lined with a stiff coat of hardened cactus juice and here in this attic the tiny owl is quite safe, looking out over



FEMALE WATER SPIDER AND HER DIVING BELL NEST

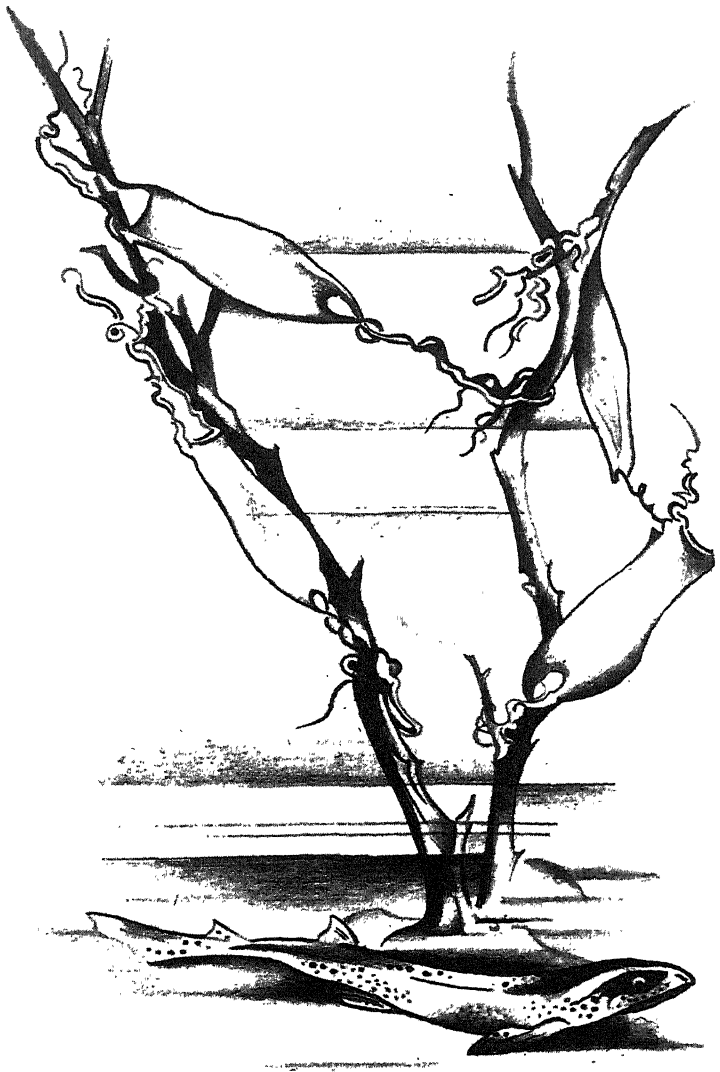
CURIOUS CREATURES

the hot Arizona desert and cactus belt of the United States, the states in the south-west. Nocturnal in its habits, it feeds on insects, ants, beetles, grasshoppers and an occasional mouse. Unlike its larger, silent cousins, the Elf Owl flies through the night with a noisy swish, a noise out of proportion to its size. It is comparable, however, in cunning, for when captured the bird often feigns death, lying limp and motionless until an opportunity for escape presents itself, an opportunity which it seizes with amazing speed.

Another bird with peculiar nesting habits is the Great Hornbill, *Dichoceros bicornis*, which is to be found in the dense forests of Bengal. This black and white bird has an enormous concave yellow beak and casque and is by far the most striking of the arboreal Hornbills — a bird behind a beak.

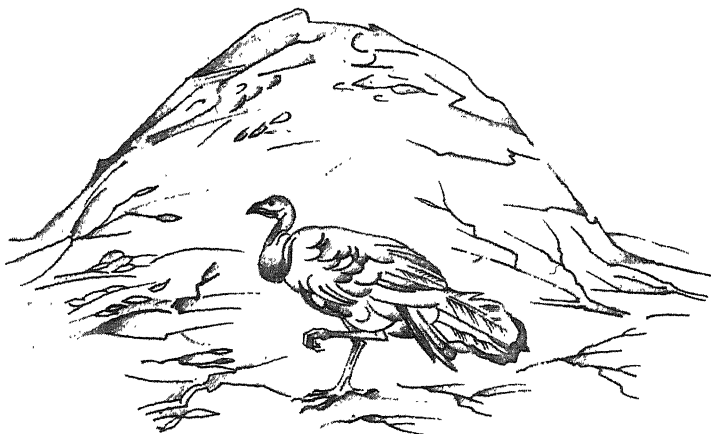
In the spring the hen finds for herself a hole in a tree and having settled proceeds to wall herself in by plastering the entrance with mud or dung, using her beak as a trowel, until only a small orifice remains through which she can barely put her head. This work is done exclusively by the female, working from the inside, and there seems to be no record of a male Hornbill ever actually entering the hole although in some species the male provides his mate with material. The device is, no doubt, a means of defence against snakes or other enemies but the hen is imprisoned until the eggs are hatched and the young are able to brave the dangers of the forest. She does not starve, for the male passes a constant supply of wild fruit, small reptiles, insects and other food through the hole. During this period, too, the females tend to moult, shedding their large feathers, which is probably a welcome relief to the birds in their cramped but sanitary 'nurseries'.

Hornbills are extremely active birds and are strong though slow flyers. The ease with which they manœuvre amidst the dense vegetation despite their enormous beaks is better understood when a dead specimen is examined and the dry horny shell of the bill is removed. The bony structure beneath the



SMALL SPOTTED DOGFISH WITH ITS EGG CASES

CURIOUS CREATURES



AUSTRALIAN BRUSH TURKEY

shell is not solid but is built up of innumerable cells or chambers separated by the thinnest of bony partitions and the whole is, in consequence, extremely light, a bill nearly a foot long weighing only a few ounces.

Entirely different from the Hornbill are the Australian Game-Birds, the *Megapodes* or Moundbuilders, which do not brood over their eggs at all. Some lay the eggs in the warm sand, some are said to select suitable places in the vicinity of hot springs, while others, like the Brush Turkey, make huge mounds of vegetable matter, the natural fermentation of which supplies the heat necessary to incubate the large eggs the birds lay in the mounds. The material for building these mounds is usually collected by several male birds working together, kicking the decaying leaves, soil and rubbish backwards into a pile. Where a number of birds combine to make the communal nest and build on the same site several years in succession, the mound may measure over a hundred feet in circumference and over six feet in height. One such mound made at Whipsnade in one season weighed over five tons. The eggs are laid in this



A LITTLE ELF OWL AND ITS HOME IN THE TRUNK OF
A HUGE SAGUARO CACTUS

CURIOUS CREATURES

mound and, well covered, remain there until hatched. The young Brush Turkeys force their way to the surface and emerge not, as one would expect, as downy nestlings but clothed in feathers which differ only slightly from those of the adult birds. In addition, young Megapodes are able to fly within an hour of this emergence, being the only species of birds hatched in such an advanced form. Thus it will be seen that there is no parental care as such, the only care taken being to deposit the eggs in a suitable environment. This habit of leaving incubation to chance is common, of course, to most living reptiles and the fact that Brush Turkeys do so may be a throw-back to the past in view of the belief that birds evolved from reptilian stock.

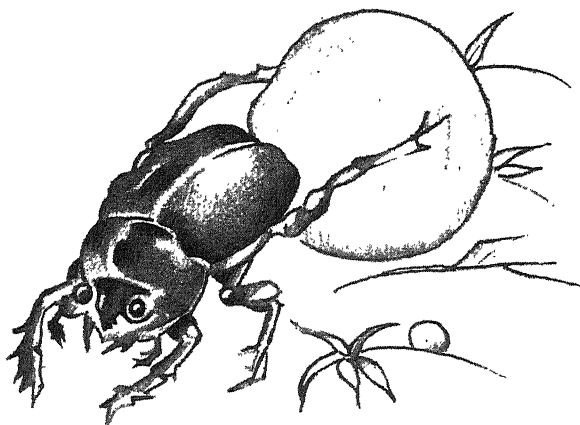
By contrast to the reptilian behaviour of the ground-dwelling Megapodes, the tiny European Harvest Mouse, *Micromys minutus*, weaves a nest which can well be compared with some of the elaborate constructions of birds. It is made in the main of blades of grass, sometimes being suspended from a twig or from stout plants but more frequently bound to several stalks of growing corn. The walls of the nest are thin but are strong enough to hold the rather large family, usually seven or eight young ones, which, tightly packed inside the meshes, have to be reared until they can see and look after themselves. The nest serves only as a summer residence for when the weather turns cold the mouse retires underground where it remains in a more or less torpid state during the winter.

The Harvest Mouse, only two inches in length, excluding the tail, and weighing only one-sixth of an ounce, has a claim to fame other than its nest-building proclivity and that is the fact that it is the only European mammal which possesses a prehensile tail. This it uses to good effect indulging in acrobatic feats amidst the corn. Sitting on a swaying head of wheat, with its tail wound round the stem, it may be seen either washing its face or gnawing enthusiastically at a grain. Found in Great Britain, mainly in the south of England, it is a most attractive creature with a reddish brown coat and white front. In addition



GREAT HORNBILL OF INDIA

CURIOUS CREATURES



DUNG BEETLE

to its other achievements, it can, if need be, swim and dive extremely well.

It is a far cry from the elegant and attractive Harvest Mouse to the humble Dung Beetle, *Scarabaeus sacer*, but the parental care of this insect, beginning even before the egg is laid, is no less interesting. The beetle feeds upon the dung of animals such as horses, camels and sheep. It moulds the substance into a ball about the size of a walnut and then rolls the pellet backwards with its hind legs into a hole or soft spot in the ground where the 'treasure' is buried. This task of rolling the pellet along may be carried out by several beetles working together. The pellets are not only consumed but are used by the females as a depository for their eggs; the grubs on hatching out feed upon this store of food provided by the parents.

Of the many species of Dung Beetle, the Egyptian *Scarabaeus*, a beautiful green with a golden gloss, is undoubtedly the best known. The *Scarabaeus* may be seen on all the Egyptian monuments, sometimes with wings closed and sometimes with wings extended with a ball between the fore legs. In Ancient Egypt



HARVEST MICE

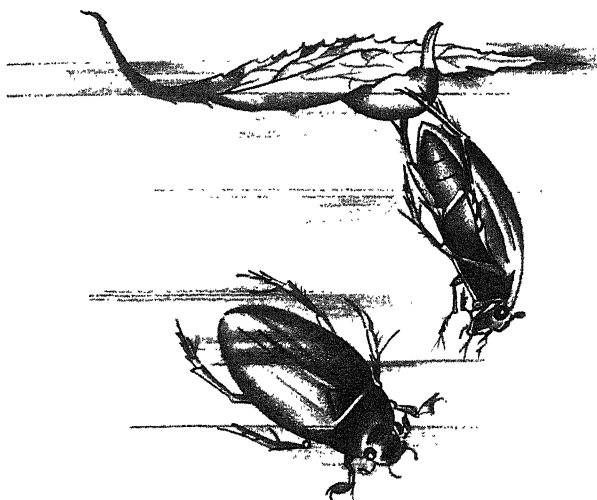
CURIOUS CREATURES

the Scarabaeus was almost certainly regarded as sacred. Charms and amulets were made in the form of these beetles from gold and precious stones, and these adorned the necks of the ancient Egyptians who, presumably, had such faith in their efficacy that they were buried wearing them. The curious notched protuberance on the front of the insect's head and the tooth-like projections on the fore-legs were considered to symbolize the sun's rays. The association of these creatures with the moon was based upon the belief that the beetles did not start feeding upon their hidden store of food until twenty-eight days, a lunar month, had elapsed after its burial.

Another insect, the Great Silver Water Beetle, *Hydrous piceus*, builds its nest under water. This species, belonging to the family *Hydrophilidae*, is to be found in practically every part of the world. In Great Britain it is most common in south and south-east England and is the largest beetle, apart from the Stag Beetle, found in this country, attaining a length of about one and a half inches fully grown. As an air-breathing insect adapted for life in water, it carries a large store of air among the fine hairs covering the back of the abdomen, which is enclosed by hard, glossy wing cases, and in addition the underside is covered by a film of air giving the silvery appearance from which it derives its name. Another feature is the very short pair of antennae, ending in a club clothed with hydrophobic hairs, which are used for breathing when the insect rises to the surface. By moving its hind legs alternately it swims on a wavering course through the water. It lives in the stagnant water of weedy ponds, ditches and dykes and feeds principally on vegetable matter.

Some idea of its general appearance having been acquired, attention must now be given to the nest which this beetle builds under water and which is the main claim to fame that it possesses. This nest, which serves entirely as a nursery, is made of silk spun by the female which has two spinning organs at the end of her body. The female Silver Water Beetle clings upside

NEST BUILDING



GREAT SILVER WATER BEETLE AND ITS COCOON

down to some water weed or floating leaves and spins a concave sheet of silk which she attaches to the particular object she has chosen. Then, assuming normal position, she repeats the weaving and fastens both sheets together to form a spherical cocoon in which she lays her eggs. This tiny craft floats on the water with a little mast which, projecting like a periscope from a submarine, is believed to supply the cocoon with air. The nest is made in four hours, and in sixteen days the larvae hatch out. The larvae, unlike the parents, are carnivorous in habit, feeding on water snails. Parental care ceases once the eggs are laid and the cocoon goes on its independent course.

Solitary bees are insects which, like the Water Beetles, never see their offspring and indeed usually die before they appear. Nevertheless their efforts in caring for their brood show considerable activity and forethought. Nests are built in the ground, in cavities of stems or other parts of plants, in ready-made crevices in walls, in holes in decaying wood and many other

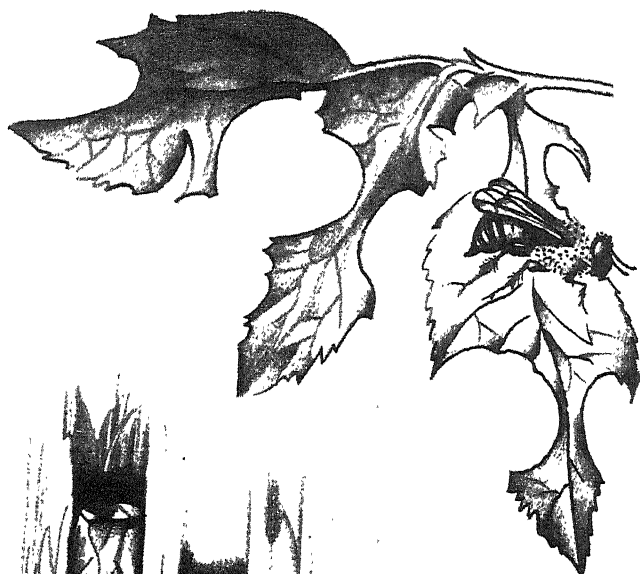
CURIOUS CREATURES

places. Most of the materials used are derived from plants, no solitary bee, so far as is known, producing wax.

Before dealing with the Leaf-Cutting Bee, it might be of interest to know that solitary bees are the predominant element in any bee fauna and that of the two hundred and more different kinds of bees found in Britain only twenty-seven species are social in their habits. The lives of all bees, however, both social and solitary, are closely linked with those of flowering plants, since bees are entirely dependent upon them for nectar and pollen and, in return, ensure that the flowers are pollinated.

Among the large group of solitary bees the Leaf-Cutting Bees have achieved a special reputation by virtue of their most curious habit of cutting out extraordinarily neat smooth-edged pieces from the leaves and petals of roses and other plants. The species most likely to be found in Britain is the Leaf-Cutting Bee, *Megachile centuncularis*, which is most partial to rose gardens, using the leaves in the construction of the cells for their eggs. The female first makes a tunnel in a decaying post or in a piece of rotten wood to a depth of as much as a foot. She then flies off to the nearest rose garden and begins cutting out circular or oval pieces from the leaves with her jaws. As soon as she has cut sufficiently far for her weight to tear off a piece she poises herself, completes the separation and flies back with the leaf to the gallery she has prepared. In flight she looks rather like a flying leaf, holding her burden in a bent position more or less perpendicular to her body. After she has transferred the leaf fragments to the gallery she sets about constructing the cells, each of which is formed by the oval pieces of leaf and provisioned with pollen and one egg. A round piece of leaf covers each cell like a lid and these cells are built end to end one on top of the other. The same bee may make a number of galleries adjacent to each other, accomplishing with great skill the aim of securing the development of her family.

In no way less skilled in the preparation of cells for their eggs are other solitary bees belonging to a group known as Mason



I



III



II

LEAF-CUTTING BEE
 I. GALLERY WITH LEAF CELLS
 II. SINGLE CELL
 III. LID

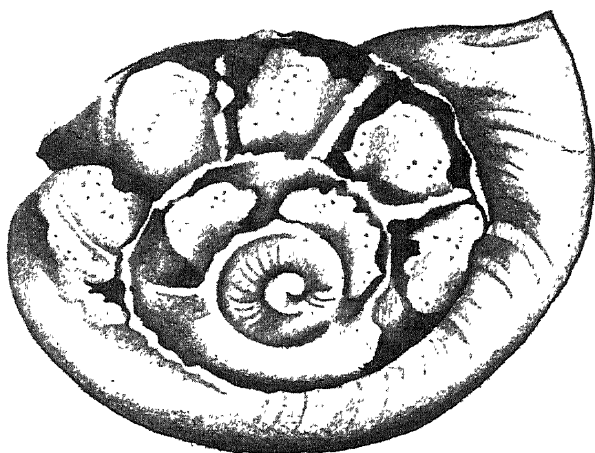
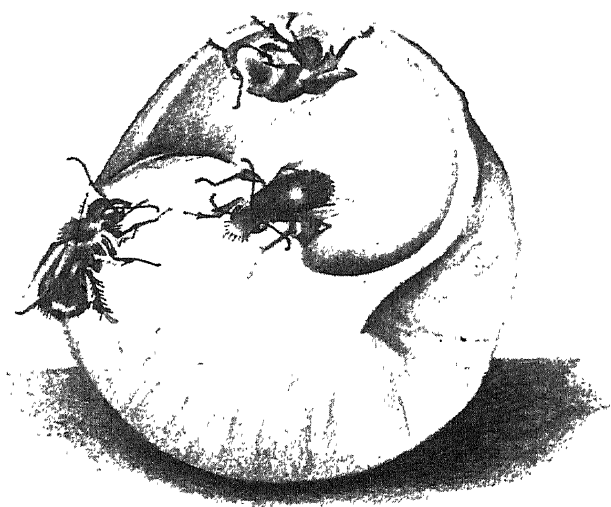
CURIOUS CREATURES

Bees, so called because they form the cells from agglutinated particles of earth, sand, minute pebbles or shavings of wood, glued together presumably with a secretion from the salivary glands. These bees have various nesting habits but for the most part they make use of ready-made holes and cavities. In collecting pollen they differ from the hive bees insofar as they have a pollen brush beneath the abdomen whilst the hive bees carry their pollen baskets on the hind legs.

The species shown in the illustration is the black and red *Osmia bicolor*, which builds her nest in an empty snail shell. A sectional view of the shell is given demonstrating the arrangement of the cells. Before closing up the entrance with a well-fitting lid, *Osmia bicolor* places small balls of pollen in the cells to provide the grubs with food. She then camouflages the cover with pine needles and moss, so hiding the future generation from parasitic enemies until such time as the young Mason Bees are capable of leaving the nursery and taking off to fulfil their own destinies.

Having dealt with two species of solitary bees let us now look at a solitary wasp. We shall be concerned only with the life and activities of the female, those of the male being, apart from mating, of little significance. Each female operates on her own and expends no little energy and perseverance in building her nest and caring for her young. Solitary wasps feed their larvae with whole insects which have been stung and paralysed, incapable of any resistance or activity. Most species are rather particular in their selection of food and consequently concentrate upon only one kind of insect as was seen in the last chapter in the case of the cicada-killer.

The illustration shows the Potter Wasp, *Eumenes*, very much enlarged. She moulds small earthen urns with narrow necks and attaches them to twigs of heather or other woody plants. The completed jug is provisioned with several small paralysed caterpillars and the egg is laid, being suspended like a pendulum from the top by a slender thread. The



OSMIA BICOLOR AND HER NEST IN AN EMPTY SNAIL SHELL

CURIOUS CREATURES

top of the urn is then sealed. The young on emergence from the egg consumes the caterpillar and sleeps safely in its urn through the winter. With the coming of the warmer weather of the spring it changes first into a pupa, later into a wasp and eventually bites a hole through the side of its mud prison. Still weak and clumsy it crawls out, but once recovered it will fly away, the familiar black and yellow narrow-waisted creature that we know, to seek a mate and to start the cycle once more.

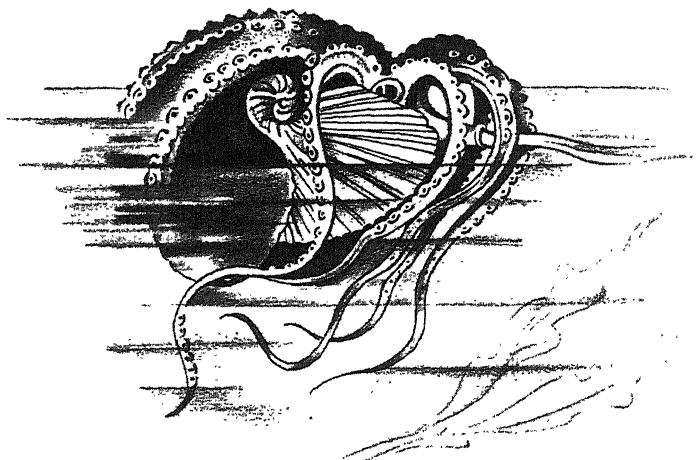
Most frogs and toads lay a very large number of eggs and show little or no discrimination in their selection of spawning grounds. They live in or near water and deposit numerous eggs in the water, taking no special precautions for their protection. As with all rules there are exceptions and some frogs have reached a high level in the care of their broods with a consequent reduction in the number of eggs laid. The Brazilian Tree Frog, *Hyla faber*, has overcome the disadvantage of her reduced egg-laying power in a very ingenious way. Both male and female go down to the water at spawning time but only the female concerns herself with the preparation of a nursery for her young. She selects the shallow end of a pool, dives to the bottom and brings up on her flat head loads of mud which she piles up to form the circular wall of a tiny pond. Using her forefeet or 'hands' to smooth it from the inside, she continues her labours until the edge of the wall is raised above the surface of the water. She completes the whole job in two nights and having laid her eggs she lurks about with her mate watching over them. The tadpoles hatch out after four or five days but remain in the tiny pond, safe from enemies, until they are both strong enough and quick enough to take care of themselves in deeper water.

In Brazil the *Hyla faber* is called the 'Ferreiro' or 'smith' because of its voice which, penetrating the tropical rain forests, sounds like a hammer beating on an anvil. When calling a frog keeps its mouth closed. Air is pushed out of the lungs into the mouth and, from there, through special openings to the vocal sacs. The latter being resonance chambers that give volume and



POTTER WASP

CURIOUS CREATURES



FEMALE ARGONAUT OR PAPER NAUTILUS

timbre to the call. I once heard a chorus of courting 'Ferreiro' frogs in South America and their primitive nocturnal concert illustrated for me in the most dramatic way the belief that early in the history of life on this planet the first voices to be heard were those of frogs.

Molluscs do not look after their offspring once they are hatched, but many of them take great care that their eggs are well protected. The Argonaut or Paper Nautilus is a small octopus but, unlike all other octopuses which have no visible shells, it has a translucent delicately-spiralled shell which is formed from a secretion of two of the tentacles. This lovely shell is produced only by the female and is used mainly as a cradle for developing her eggs. It is not an integral part of her body, being only grasped and held closely to it by a pair of tentacles which are expanded to form great lobes almost covering the shell.

Early naturalists believed that the shell served as a boat and that the lobed tentacles were spread as sails. This supposed fact



HYLA FABER

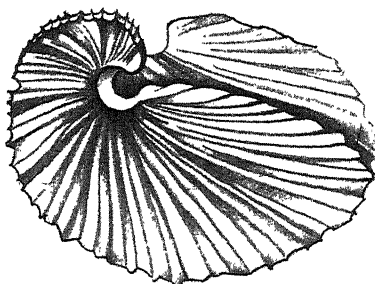
CURIOUS CREATURES

naturally appealed to the poets and Byron celebrated these imaginary feats of seamanship in the familiar lines —

The tender Nautilus who steers his prow,
The sea-born sailor of his shell canoe.

Unfortunately this pretty romance has been completely upset by the findings of modern science and it is now known that the animal floats on the surface only when ill or torn from its customary hunting grounds by heavy storms. Usually it creeps along the sea bed or disports itself in submarine grottoes like the ordinary octopus, with which, in point of fact, the shell-less male conforms in all essential details.

Found only in the Mediterranean, the little, large-eyed Argonaut, seeming to change colour with every movement of its body, carries its strange cradle through the water as a striking example of maternal care no less wonderful than the extravagant fable of the sailing Nautilus.



SHELL-NEST OF THE FEMALE ARGONAUT

NURSING FATHERS

IN the last chapter it was shown that the responsibility for the family usually devolved upon the female. There are, however, many instances where, for reasons unknown, the order is reversed and (apart, of course, from the actual laying of the eggs) the future generation depends on the care of the male. In many widely different classes of animals the 'nursing father' is an established fact.

Nursing fatherhood is fairly common among fishes, but reaches its peak in the case of the little Sea Horse, *Hippocampus*, the smallest of all marine fishes. This creature, so unlike a fish, is only a few inches long and has a stiff skin made of plates. A very feeble swimmer, most of its motive power is derived from a permanently vibrating dorsal fin. The prehensile tail is wonderfully developed and is used for anchoring to floating seaweed or stems. Clinging to these drifting plants the helpless creature spends its life largely at the mercy of wind and waves. It is more or less cosmopolitan in warm seas, and the common species is to be found on both sides of the Atlantic. It has been observed of Sea Horses in captivity that the lips give quite a distinct smack when closing upon some minute brine shrimps on which they live, and also that these amazing little creatures can move their eyes independently.

The remarkable nursing habit of the fish was discovered only during the last century, when a French naturalist observed that the male Sea Horse has two flaps of skin on the front of its body forming a pouch, and that into this pouch one or more females press their eggs, the male thereafter taking sole charge of the future generation.

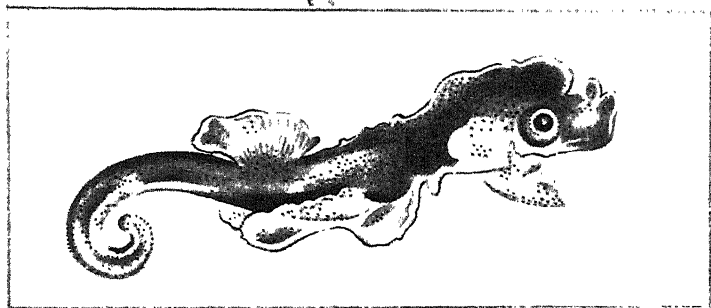
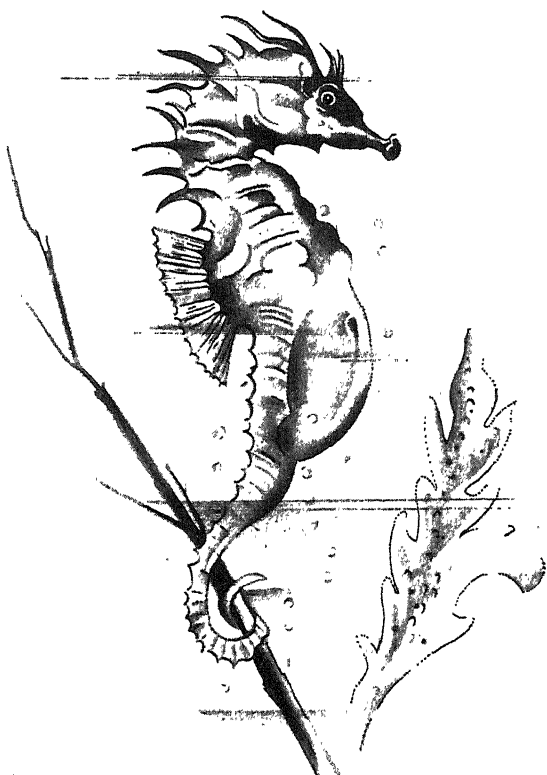
The embedded eggs, after being fertilized, are able to draw

CURIOUS CREATURES

nourishment from the pouch in much the same way as embryo mammals draw sustenance from the placenta. Throughout the period of incubation, between forty and fifty days, the Sea Horse swims constantly in the upright position common to his species. He can rise vertically through the water by straightening his tail or can sink by curling it into a spiral. By movements of both tail and dorsal fin he can creep very slowly along the floor of the sea bed. Only a few hundred eggs are accommodated in the pouch, each provided with a yolk sac. At the end of the incubation period the infant Sea Horses are expelled one by one through a slit by a muscular contraction of the pouch. During this birth it looks as though the father is undergoing a severe attack of cramp. Attached by his tail to a stem of a plant he bends his body rapidly backwards and forwards until the opening in the pouch distends and one of the baby Sea Horses pops out head first.

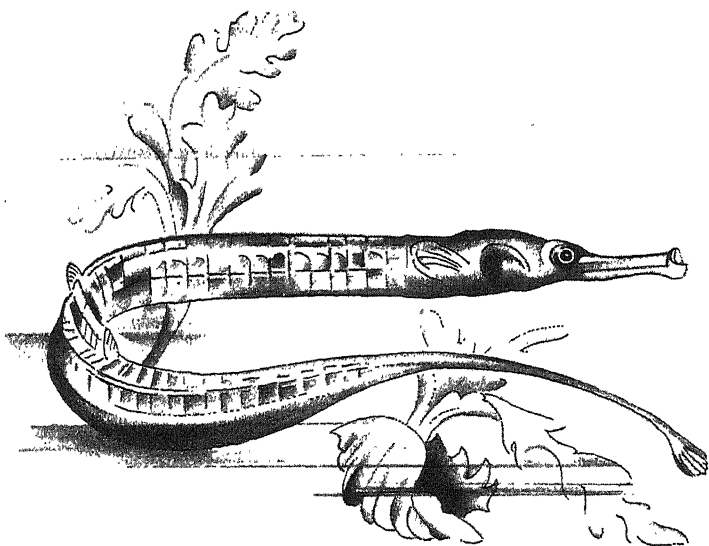
These young Sea Horses enter upon life more or less as miniature replicas of their parents, though less opaque in their colouring, and without the curious horsey tilt of the head which is in fact rather big and clumsy.

The grotesque Pipe Fishes, abundant in all temperate and tropical seas, are related to the Sea Horses and, with the exception of two species, breed in much the same manner. The male has two flaps of skin under the abdomen which fold one upon the other to form the pouch in which the young incubate. The tail of the Pipe Fish is not so prehensile as that of the Sea Horse, but it still contrives to anchor its owner in an almost upright position quite securely to weeds. The colour of the fishes changes with the sea weeds among which they feed, and a specimen which may be bright green among eel grass quickly accommodates itself to red or brown weeds should it by chance drift among such plants. One of the largest species, *Syngnathus griseo-lineatus*, shown in the illustration, attains a length of little more than one foot, but most Pipe Fishes are very much smaller.



MALE SEA HORSE AND NEWLY BORN YOUNG

CURIOUS CREATURES



PIPE FISH

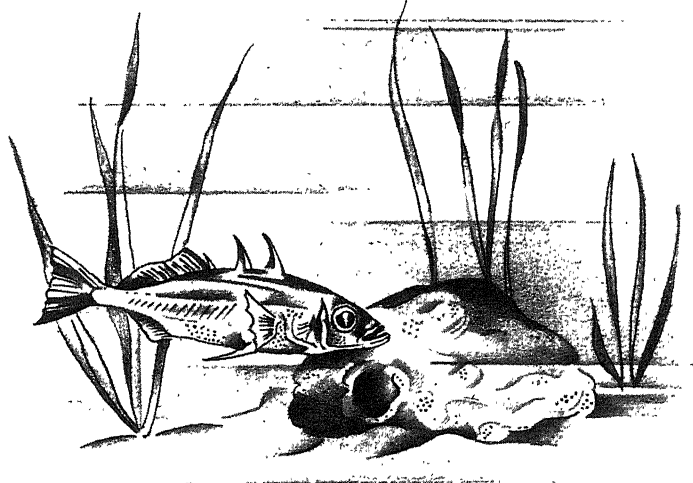
The long, bony, slow-drifting Pipe Fish attracted the attention of as early an observer as Aristotle in the third century B.C. who wrote: 'That fish which is called Belone at the season of reproduction bursts asunder and in this way the ova escape; for this fish has a division beneath the stomach and bowels like the serpents called typhinae. When it has produced its ova it survives and the wound heals again.' This is in all probability the first account of the remarkable reproductive method of the Pipe Fish.

Another relative of the Sea Horse and the Pipe Fish is the Stickleback, of which there are several species in both salt and fresh waters, all of them indigenous to the northern hemisphere. The Three-spined Stickleback, *Casterosteus aculeatus*, found in Asia, Europe and North America, is so called because of the

NURSING FATHERS

sharp, isolated spines on its back. Other species have from five to twelve or more such spines.

The male Stickleback, the maximum size of which is not much more than three inches, has his own peculiar method of nursing fatherhood. In spring he assumes a vivid red hue and builds a round nest from available vegetation and debris, with front and back entrances leading to a tubular hallway. The fine straws and grass blades constituting the nest are cemented together with sticky threads which are a secretion of his kidneys. This nest is concealed in vegetation or in rock pools where there is a moderate flow of water and the inside is covered with marine glue, which comes from his body and is spread by the fish swimming in and out of the nest. The nursery completed, the Stickleback flaunts his bright colouring before a female of the species until he induces her to lay some eggs in the nest, often poking her with his snout or spines. These eggs he fertilizes immediately, and he repeats his courtship with other females until there are sufficient eggs in the nest. He then



THREE-SPINED STICKLEBACK GUARDING HIS NEST

CURIOUS CREATURES

guards the entrances, charging furiously against all intruders, and not hesitating to attack fish two or three times his own size.

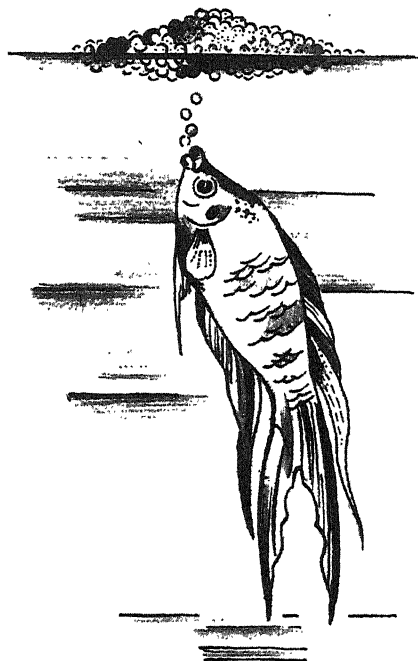
The two entrances allow water to flow over the eggs, the current being aided by the fanning movements of the male's fins. The eggs hatch after a period of from eight to twelve days, but the young are kept inside the nest until they are such strong swimmers that their father is no longer able to pick up deserters with his mouth and tow them back.

Sticklebacks live in small shoals, preferring ditches, little streams and the shallows of rivers and ponds. They are accomplished hunters, mainly of insects, worms, fish spawn and baby fry. In his book on fishlore, A. F. Magri MacMahon asserts quite emphatically that if the innumerable Sticklebacks of British shores and rivers grew as large as pike then the waters would become, even to man, more dangerous than they would be if inhabited by alligators.

As we have seen, the Stickleback makes use of a glue emanating from his body in the making of his nest. Air bubbles would seem to be a curious material from which to fashion a nest, but they are used by the Chinese Paradise Fish, *Macropodus opercularis*, and the male, by taking air into his mouth on the surface of the water and expelling it again mixed with a sticky mucus, produces them himself. This small froth-blower, having busied himself for some time in this way, lures the approaching female. When she has been found he brings her to the fragile nest beneath which, after an elaborate courtship, she turns on her back and lays her sticky eggs, fertilized at once by the male. With most species the eggs, being lighter than water, rise, but any egg which fails naturally to adhere to the bubbles is placed in position by the male with his mouth. This act of egg-laying is repeated several times. In species in which eggs are heavier than water the male has to catch them before they have time to sink to the ground.

After the eggs have hatched the larvae remain in the foam nest for some days, and if any of them should show a tendency

NURSING FATHERS



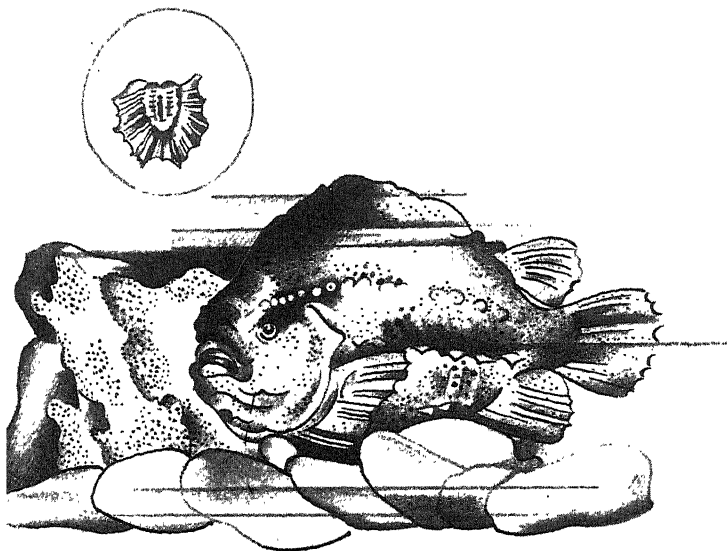
CHINESE PARADISE FISH AND ITS BUBBLE NEST

to sink they are caught and replaced by the watchful male until they are sufficiently advanced to fend for themselves.

Since the female Paradise Fish, like the female Stickleback, is given to cannibalistic tendencies, the male in his fiercely defended territory has to include her among the enemies from which the young have to be protected. Should the male himself be eaten by a predatory enemy, or die from natural causes, quite obviously the eggs do not hatch.

A heavy toll is taken of unprotected eggs in the water and

CURIOUS CREATURES



LUMPSUCKER

Above: THE SUCKING DISC

there are many instances of parental care extending far beyond the mere choice of locality for laying the eggs in order to secure maximum protection. The female Lumpsucker, *Cyclopterus lumpus*, a heavy dumpy fish, attaches her eggs in sticky masses to rocks or logs, and then takes no further interest in them. After the eggs are fertilized the male Lumpsucker, whose devoted parental habits have earned him the name of 'hen fish', endeavours for sixty to seventy days to keep about a hundred thousand eggs free from harm, and guards his brood even when the spawn is left stranded on the shore by the tide.

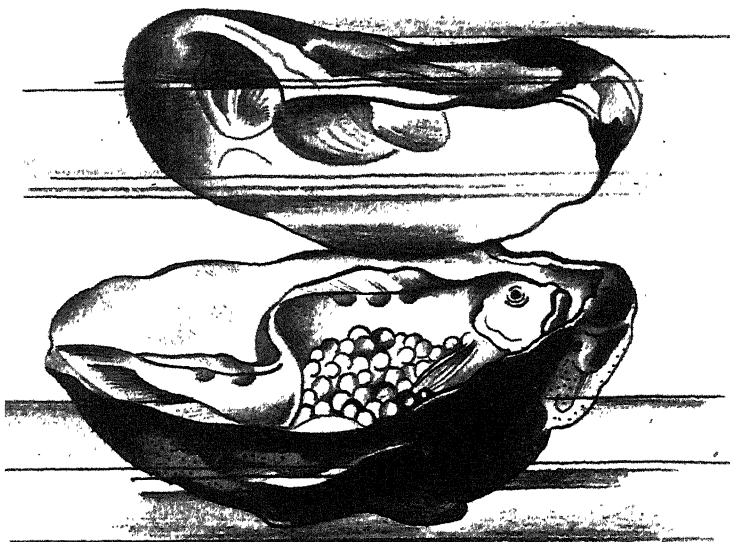
Lumpsuckers are feeble swimmers but, their ventral fins being united in a round sucking disc, they can anchor themselves to the rocks, moving only occasionally and very slowly except when making a sudden dash after their prey. Unlike

NURSING FATHERS

their parents the young Lumpsuckers are very active, only using their suckers when they come to rest.

During the courtship the male is a bright red hue, but when mating has taken place and the desperate fight for the protection of his offspring is about to begin, he loses this attractive colouring. Lumpsuckers are to be found all along the coasts of the North and the Baltic Seas, although nowhere in any great numbers.

The problem of protecting its eggs is solved by the Butter-Fish, *Centronotus gunnelus*, in a very different but no less careful and effective way. These fishes, about ten inches in length when fully grown, roll the mass of spawn into a ball, an operation in which both parents take part, and use a hole or empty shell as a nest. It is usually the male which, coiling its body around the eggs, remains on guard. The illustration shows a fish having



BUTTER-FISH USING AN EMPTY SHELL AS A NURSERY

CURIOUS CREATURES

taken possession of an empty oyster shell, a ready-made abode which is shared with some limpets which cling to the inside of the upper valve.

So far we have dealt with nursing fatherhood among fishes. Among the many animals which practise this reversal procedure in bringing up their families there are some male toads and frogs which, like the Sea Horses and Pipe Fishes, use their own bodies as nurseries.

A curious little frog, *Rhinoderma Darwini*, discovered by Darwin in Chile, is a most striking example of a paragon among nursing fathers. This frog has a pair of external sacs, normally used to increase the volume of the voice, which open into the mouth on either side of the tongue. While it is not generally known how the eggs reach their destination, O. Buerger maintained that in the breeding season the minute male takes the fertilized eggs, which may number anything between five and fifteen, in his mouth and places them in the sacs. The eggs develop and soon, as the embryos feeding on their yolk sacs grow, require more accommodation. Conveniently, the skin-pouch spreads, first down the throat, then along the sides until it covers the whole of the lower surface of the body. Not only the hatching but the further development of the young takes place in this secure retreat, from which they escape in due course one by one through the mouth as miniature replicas of their parents, which themselves reach a size of only an inch and a quarter. In the illustration the frog has been dissected on the ventral side in order to show the froglets in the embryo stage.

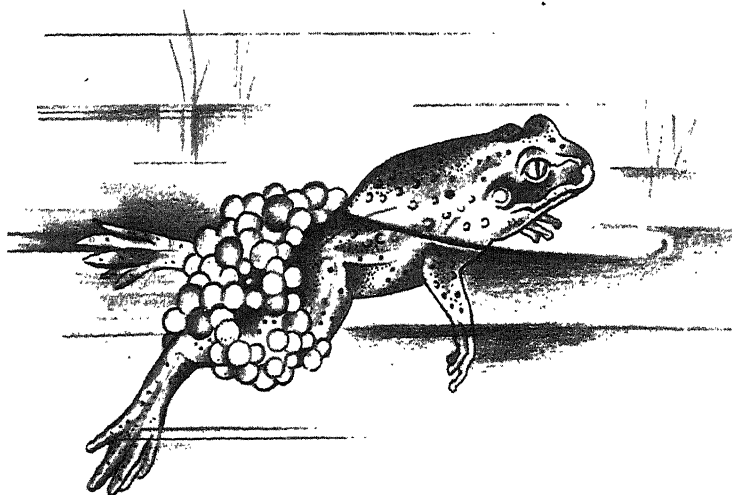
A common European amphibian is the small aptly named Midwife Toad, *Alytes obstetricans*. The eggs are laid on land in two long strings, through the loops of which the male thrusts his hind legs and then retreats to a hole. At night he comes out to feed and at the same time to moisten the eggs, sometimes carrying them down to the water and submerging them. After



RHINODERMA DARWINI

Above: MALE SHOWING VENTRAL BROOD POUCH WITH EMBRYOS

CURIOUS CREATURES



MALE OF EUROPEAN MIDWIFE TOAD

about three weeks of careful nursing he carries the young, now ready to emerge, down to the nearest pond. The gelatinous covering to the eggs is softened by the water into which the young at once force their way.

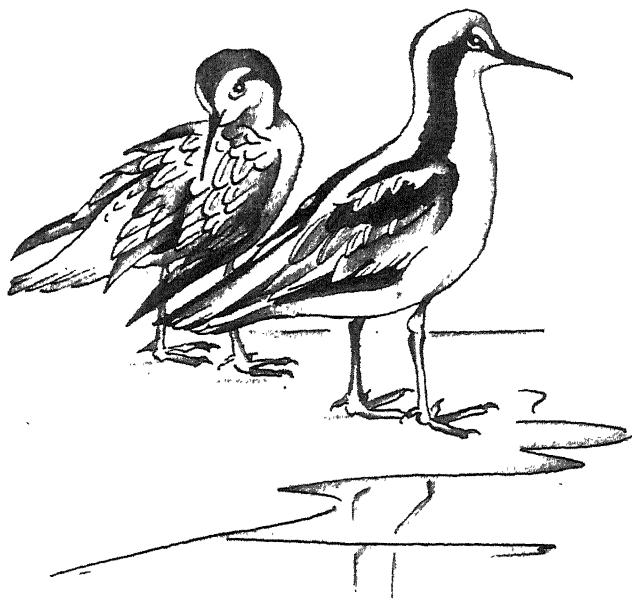
With most birds, if there is a difference in coloration between the sexes, the plumage of the male is the brighter. This is not so in the case of the *Phaleropes*, for here the females in all families are both brighter and bigger. Vain about their attractive visible features, they have no interest in home and family once the eggs are laid. They do not build the nest, neither do they incubate the eggs, nor do they care for the young. Indeed, even in courtship the female is the aggressor and it is no uncommon sight to see the poor, small, almost insignificant male being pursued by two large, brightly-coloured females with necks outstretched and filling the air with the sound of curious grunts.

NURSING FATHERS

After the eggs have been laid the females disport themselves, and their charms, in scattered flocks, while the luckless males are left to hatch the eggs and to rear the young.

Phalaropes are swimming sandpipers, whose toes are lobed rather than webbed, and they can swim like miniature ducks, nor do they hesitate to do so. Some species even pass the winter months on the open sea, where their dense breast feathers and downy undercoat are just as waterproof as those of ducks.

Wilson's *Phalarope*, *Steganopus tricolor*, is a species confined exclusively to the New World. It winters in the south of Chile and Patagonia and passes the summer in Central California and Manitoba where it is to be found on grassy ponds



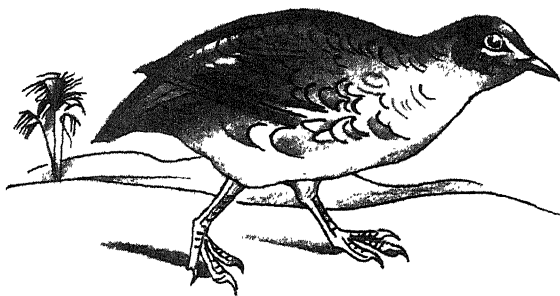
WILSON'S PHALAROPE
THE LARGER FEMALE IN THE FOREGROUND

CURIOUS CREATURES

and prairie marshes, feeding almost entirely on aquatic insects. The toes of this dainty little bird are less broadly lobed than those of the other species, consequently it is more terrestrial in its habit.

Similar to the *Phalaropes* in their breeding habits are the *Turnicidae*, secretive little birds rather like dwarf quails, but without a hind toe. The twenty-two known species of this large family have a wide geographical range, being found in Europe, Africa, Madagascar, South Asia, the Indian Archipelago and Australia. They are restricted to grassland areas where they live well hidden until the mating season. It is the prerogative of the bigger and more brightly coloured female to take the initiative in courtship and to call and even fight for the smaller, modest-looking male who, later on, will have to perform all the breeding duties apart from the laying of the eggs. The pugnacity of the females of some Asiatic species has led to the natives keeping them as a kind of 'fighting cock' for fights on which small wagers are laid.

The species shown is *Turnix sylvatica* which is found in parts of Northern Africa, Spain and Sicily, a most handsome representative of a family demonstrating the reversal of the usual relationship of the sexes.



TURNIX SYLVATICA

CHAPTER IV

WATER CREATURES THAT BREATHE AIR

ANIMALS that exist both in and out of water are generally termed amphibious, most of them being so formed that they can carry on living, at any rate for a time, in either of the two elements air and water. The common forms known to most of us are the frogs, toads, newts and salamanders, but there are others not so generally known.

Among the lower forms of life able to exist both in and out of water is a newt-like creature given the name Axolotl by the ancient Aztecs of Mexico. The Axolotl, a distant cousin of the frog, is a strange-looking animal with three pairs of delicate feathery gills growing from the sides of the neck. It is to be found in North America and in certain lakes of Mexico. So long as it maintains an aquatic existence it lives, reproduces and dies as an Axolotl.

Discovered by the Spanish conquerors of Mexico in the sixteenth century, it was not considered remarkable in any particular way, except perhaps as a delicacy which appealed to the Mexican palate when fried and seasoned with Spanish pepper.

Certain tailed amphibians, allied to newts but more addicted to terrestrial life, are known as salamanders and one common European form (the Spotted Salamander) was believed to be 'bred and nourished by fire'. The Tiger Salamander, *Ambystoma tigrinum*, is fairly common in America, from New York to California, and Mexico but until 1865 no one had reason to connect it with the Axolotl. In 1865, however, some Axolotls kept in Paris, where they bred for several generations, started losing their gills and fins, began to breathe with lungs, developed eyelids, acquired yellow spots, and changed into

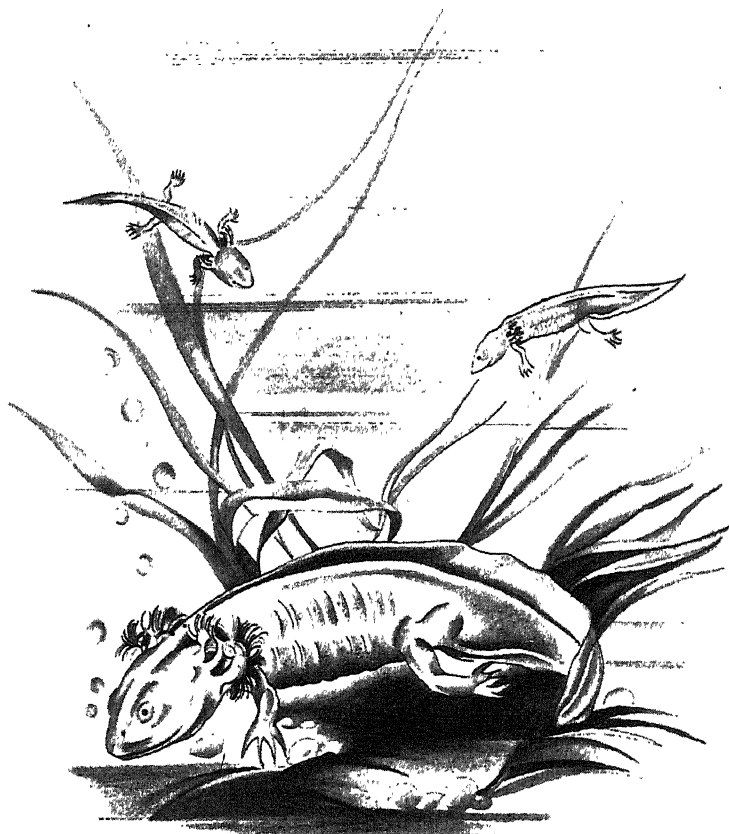
CURIOUS CREATURES

salamanders in much the same way as tadpoles suddenly seem to become frogs. Thus it became clear that the supposed adult Axolotls were simply the aquatic larval form of the North American Salamander.

Several ways of bringing about the transformation of these species are now known, the most obvious, of course, being the change from an aquatic to a terrestrial existence due to the drying up of the waters in which the Axolotls lived. In captivity it has been discovered that artificial feeding with thyroid will at any time produce the change. But whatever the stimulus for this fascinating conversion, the persisting aquatic Axolotl, which in some cases never changes, can be regarded as a sort of permanent larva which has refused to grow up. A sort of Peter Pan of the animal world.

There are three different kinds of Lungfishes found in the fresh waters of Africa, Australia and South America. They are primitive creatures and resemble in some ways the fossil-fishes of the Devonian Period of hundreds of millions of years ago. In this early stage of the world's history fishes were the predominant form of life and it is believed that species appeared related to our lungfishes or double-breathers (Dipnoi) which developed lungs as well as gills. It was probably from a stock of Devonian Dipnoi that the first Amphibians sprang. The Lungfish can breathe oxygen dissolved in water by means of its gills; it can also breathe dry air by means of its swim-bladder which has become a lung.

The species shown in the illustration is the African Lungfish, *Protopterus annectens*, and in the dry season he buries himself at the bottom of a stream, leaving only a small aperture at the top as an airhole through which he can breathe with his lung. So he remains for as much as six months on end, encased in hard dry mud, during the dry season. When the rains come again and the mud is softened the fish, well protected by a slimy secretion to preserve the body moisture, awakens from his sleep and makes his way into the water with whip-like



AXOLOTL

CURIOUS CREATURES



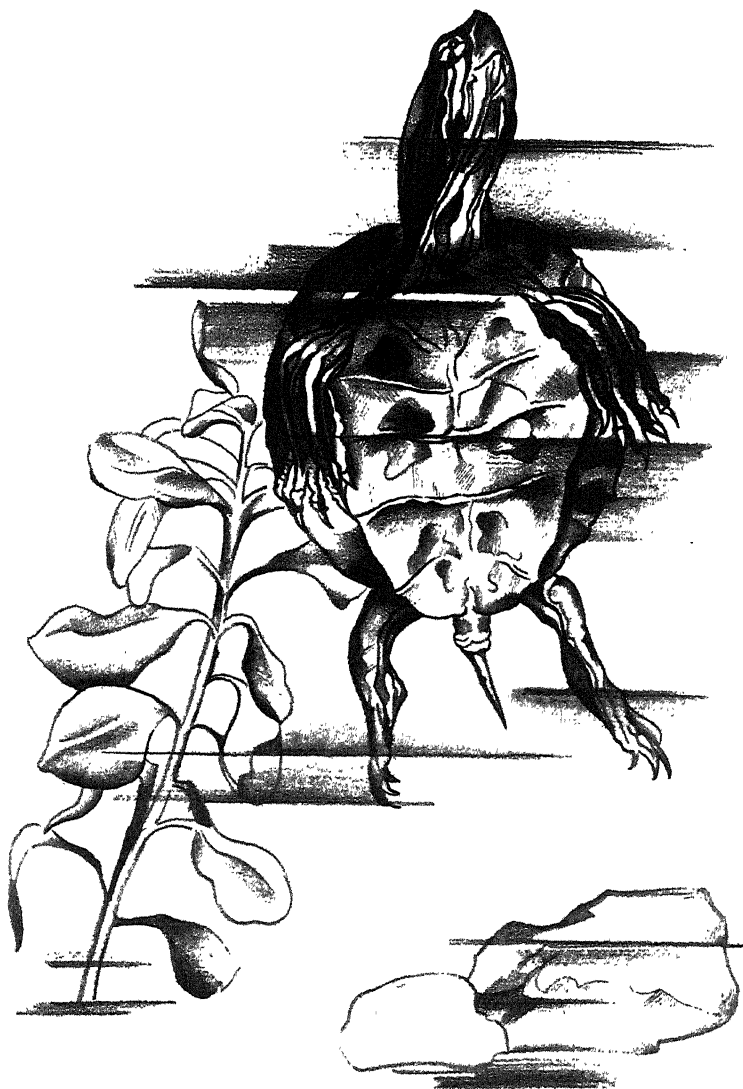
AFRICAN LUNGFISH

flippers. During this period he is a greedy, carnivorous robber, feeding and fattening himself for the fast of the next dry season.

African Lungfishes have arrived on many occasions in their mud cocoons or encasements in Zoological Gardens from the Gold Coast and when liberated have been quite lively, but so far they have not been persuaded to bury themselves while in captivity.

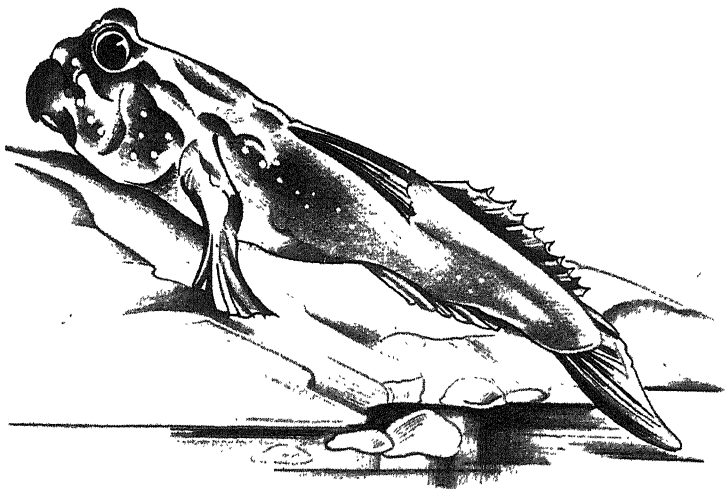
The Mud-Skipper, *Periophthalmus kolreuteri*, which lives in the mangrove swamps of tropical Africa, spends its time half in the water and half on land. It skips about by means of its strong pectoral fins on the mud-flats and literally leaps upon its prey; it jumps from stone to stone hunting small shore-animals and can climb up the roots of the mangrove trees. The close-set eyes on top of its head protrude greatly but can be withdrawn into hollows situated just below them. About six inches in length, it returns to the water to breed and to escape its enemies. So long as its gills are damp it can exist for a long time out of water.

The Carolina Box-Tortoise, *Terrapene carolina*, comes, as its name suggests, from North America, and it forms a link between the tortoises living entirely on land and the terrapins that spend their lives in fresh water. The name, Box-Tortoise, is derived from the nature of the carapace or shell which can



CAROLINA BOX-TORTOISE

CURIOUS CREATURES



MUD-SKIPPER

be completely closed by means of hinged flaps. The undershell is very brightly coloured, and no two specimens are quite alike in the variegated and beautiful markings. The hands and feet are used not only for swimming but also in its movements on land, the fingers and toes being provided with claws, but the feet are only partly webbed whereas the true water-terrapins have fully webbed toes. The Box-Tortoise actually spends most of its time on land, but it can swim very well when it takes to the water.

On land it is a shy, frightened creature, hiding itself during the day and hunting at dusk. Unlike the land-tortoises it is not a vegetarian but feeds on snails, slugs, worms and insects. When, in its search for food, the Box-Tortoise is attacked by a larger animal it withdraws closely into its shell and is thus extremely well protected. This ability to withdraw in the face of opposition may well be one of the reasons why the Box-Tortoise lives to a ripe old age, at least sixty years; another reason, possibly, is the fact that, like the land-tortoise, it buries



THE OTTER

CURIOUS CREATURES

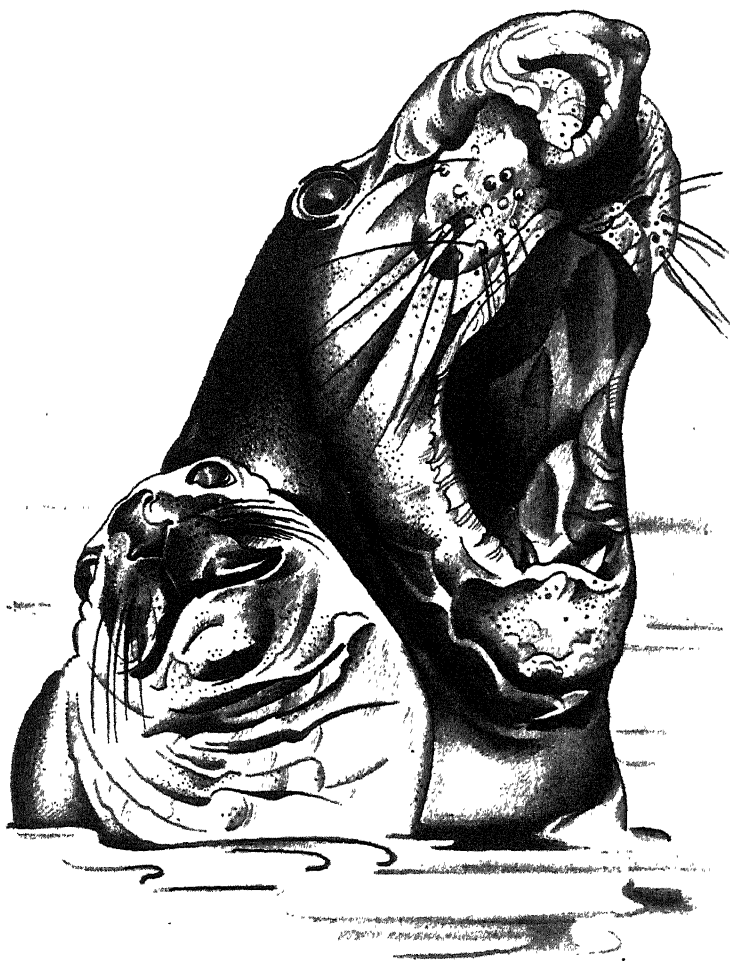
itself in the autumn and sleeps through the winter until the spring.

The Otter, *Lutra lutra*, is one of the few wild carnivores left in the British Isles. In its present geographical distribution it extends from Ireland to India. It is really a land animal which has adapted itself for life in the water, its body being beautifully stream-lined, its fur thick and soft, and its toes webbed for swimming, which it does with extreme grace and speed, being swifter through the water than the sleekest salmon.

Otters feed mainly on fish but condescend to eat mussels and limpets from the sea-shore, frogs from the marshes, and occasionally wild duck and rabbits. It has been said that the Otter has the wretched habit of devouring only the 'prime middle cut' from a salmon, leaving the head and the tail floating. Most of their hunting is done by night.

The Common Otter measures about thirty-six inches and more in length and may weigh up to thirty pounds. It has small, vivid eyes and the ears, hidden in the thick fur, can be sealed by a fold in the skin when entering the water. Otters usually live in burrows in the river banks with the entrances under the water. They are devoted parents producing one litter of two or three every year. The young remain blind for about the first three months of their lives and the male parent is reputed to stand guard over the entrance to the burrow during this time. The cubs, like the beavers, have to be instructed in the art of swimming but are quick to learn.

Otters do not hibernate and when they are not able to find their usual food, if the rivers or lakes are frozen for instance, they have been known to raid poultry runs. They have been known, too, to hunt for pike beneath the ice of the lake. The Otter holds its own by virtue of its strength, keen senses, alert wits, roving habits — it has been known to travel fifteen miles in one night — versatility of diet and hunting grounds, resourcefulness when hard pressed and, perhaps most important of all, the very careful education of the young. The greater part of its



GIANT ELEPHANT SEAL AND YOUNG

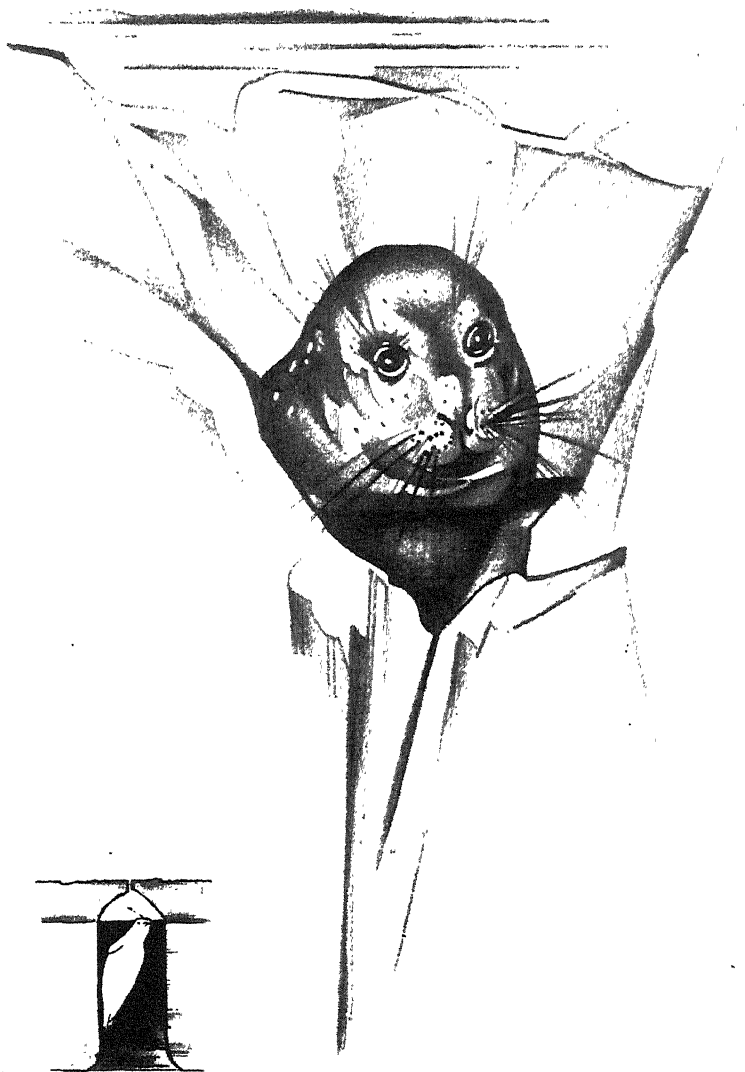
CURIOUS CREATURES

struggle for existence in Britain, at any rate, is overcoming the difficulties of modern life. There is a distinct possibility that unless otter-hunting is curbed or controlled the Otter will join the Dodo and the Passenger Pigeon as a museum piece.

Seals are counted among the carnivorous mammals because they live on fish, but they spend the greater part of their lives in the sea and differ from land carnivores in that the fore and hind limbs are, in fact, paddles or flippers. Some, such as the Sea-Lion, have the hind flippers turned forward so that they are able to move about on land fairly quickly. In the true seals, however, the hind limbs are extended behind the body rather like a tail, which means that on land they depend entirely upon the front flippers for movement, making them slow and ungainly.

The largest of the seal family is the Giant Elephant Seal or Sea Elephant, *Mirounga leonina*, found in the waters of the Antarctic. It used to be found on many of the islands of the South Atlantic, Pacific, Indian and Antarctic Oceans and even as far north as Juan Fernandez but it has been hunted so diligently on account of its value commercially, for its oil and fur, that there is a grave danger that yet another species will die out. The male may attain a length of twenty feet and weigh several tons. These seals get their name not only from their size but from a short trunk or proboscis which can be inflated or deflated at will. This proboscis may be as much as thirty inches in length when inflated, and it is a feature only of the fully developed male seal, the young male have no proboscis. Living entirely on fish these animals are voracious eaters. They have occasionally been brought into captivity, but most zoos find them too expensive to keep on account of their vast consumption of fish.

Among the smaller seals is the Greenland Seal, *Phoca groenlandica*, sometimes called the Harp or Saddleback Seal from the black band extending from the shoulders down either side of the body. The average length is six feet. In the depth of



GREENLAND SEAL

Below: DIAGRAM SHOWING THE AIRHOLE IN THE ICE



DUGONG OR SEA COW

WATER CREATURES THAT BREATHE AIR

winter the Greenland Seal migrates southwards, very occasionally reaching the shores of Scotland, living in the main on and around ice floes rather than the pack ice. It tends to avoid the land and even gives birth to the young on the ice. For the first seven weeks the young have a dense, woolly, snow-white fur which, unfortunately for them, is in great demand among fur-traders. Those seals which inhabit the pack ice usually keep an airhole free through which they can come up to breathe since no seal can remain submerged indefinitely; it is said that even when asleep seals rise automatically to the surface to breathe.

Although the natural order known as Sirenia, to which the Dugong or Sea Cow, *Halicornia dugong*, belongs, resemble seals in some ways they are not in fact related in any way, but bear a closer relationship to the elephant. The forelimbs are flippers and there are no hind limbs, the tail being used as a sort of horizontal rudder. The Dugong has very small eyes and ears but huge clumsy lips. The presence of large breasts between the forelimbs is said to have given rise to the old legend of the mermaid. Seen at a great distance this animal, lolling in shallow water, might well have suggested a siren or sea-nymph but the illusion is soon shattered at close quarters and the old sailors must have had vivid imaginations to have perpetuated the legend.

Dugongs are found mainly in the Indian Ocean, while a close relative, the Manatee, is to be found on both sides of the Atlantic. They never leave the water but frequent estuaries of large rivers where they live on seaweed and aquatic plants. Like other aquatic mammals they must come to the surface to breathe although their large lungs enable them to stay under water for quite a considerable time. Generally they are about nine feet in length although Behring, some two hundred years ago, found a Sea Cow over twenty feet long. He discovered this largest species of any Sirenia when he was shipwrecked on the Behring Islands, but unfortunately this enormous but stupid animal became extinct soon after its discovery although bones are still found occasionally in the islands.

CHAPTER V

ANIMALS AND PLANTS

THE earliest living organisms, traced by fossil records, were simple marine animals and plants, not unlike those we call Protozoa (first animals) and Algae (seaweed) today. From this beginning, it is believed, has developed the multiplicity of forms of life we now see about us. It is not the purpose of this book to go into the matter deeply but it is of interest to note that though the evolutionary development of animal and plant life was along two entirely different courses, there is still a very close link between them. While plants depend upon animals to a certain extent for food and help in fertilization, animals are entirely dependent upon plants for all their food and for some of the oxygen they breathe. Even strictly carnivorous animals eat the flesh of animals that were plant-eaters.

The floral structures of plants are numerous in detail and in function, each flower solving in its own way the problem of transferring pollen from the male anthers to the female stigma. This process is often very complicated since a great number of plants have only male flowers, producing pollen but no fruit, and the female flowers of the same species occur on another plant of the same species. In some cases plants bear simultaneously both male and female flowers but still require cross-pollination. All these plants have to ensure that the pollen, which in itself is immobile, is transported by some external agency to the stigma in order that the female plant may be brought to fruition. Some rely on the wind for pollination, but others depend on various forms of animal life as pollen carriers and this dependence has led to curious partnerships between animals and plants.

A striking example of plant and insect working together is



POLLINATION OF THE YUCCA BY ITS MOTH PRONUBA

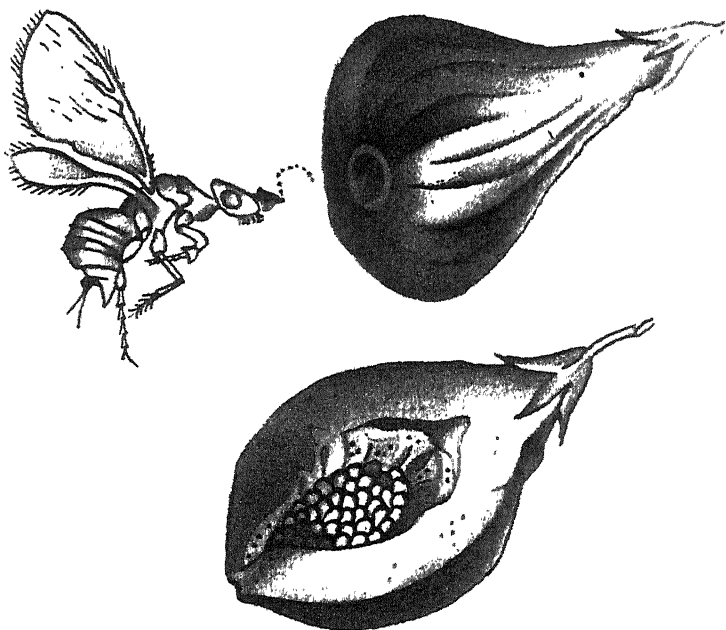
CURIOUS CREATURES

that of the North American *Yucca* and its moth *Pronuba*. The flower of the *Yucca* can only be pollinated by this moth, while the caterpillar of the moth can live only on the bell-like flowers of this plant. The female *Pronuba* moth, after being fertilized, visits a *Yucca* flower, fashions a big ball with her mouthparts from its pollen and flies to another *Yucca*, where she deposits it on the stigma and then lays her own eggs with the help of an ovipositor in the ovary of the plant. In this way fertilization of the *Yucca* is ensured; the seeds develop and with them the caterpillars. The fact that the caterpillars feed upon the plant does not mean that there is any danger to it, for the large number of seeds produced is sufficient both to feed the caterpillars and to leave a few to ripen. Eventually the well-fed caterpillars leave their shelter and fall to the ground, where they pupate during the winter and emerge as moths in the following year in time for the blooming of the *Yucca* with its great panicles full of blossom, when the strange partnership of moth and plant, the heavily-scented flowers of which open at night, again pursues its course. Thus it will be seen that the *Yucca* generously provides temporary shelter and nourishment for services rendered.

The case of the fig and *Blastophaga psenes*, a tiny relative of the wasp, is yet another example of the interdependence of plant and insect.

There are two varieties of fig trees, and in both the flowers are born inside the young fig. The wild fig, *Caprificus*, of Asia Minor, bears both male and female flowers within the same fig, while the cultivated Smyrna variety bears only female. The minute flowers are born on the inner walls of the fleshy structure, each 'seed' representing a single flower. Owing to lack of fertilization the immature Smyrna figs do not ripen or drop off. In the wild fig, however, *Blastophaga psenes* makes its home and undergoes its development. The female lays her eggs on the ovaries inside the base of special abortive figs. This starts galls and the wingless male, emerging first, comes out and

ANIMALS AND PLANTS



BLASTOPHAGA PSENES AND THE CULTIVATED FIG

hunts at once for a gall containing a female of his own kind. As soon as he finds her he gnaws his way into the gall and fertilizes her inside her cradle. When ready to fly she forces her way out and, by crawling over the male flowers on top of the fig, she leaves her home dusted with pollen. She then searches for a nearby fruit in just the right condition to lay her eggs and to secure shelter for a new generation. This is the normal cycle of the chalcid wasp, *Blastophaga psenes*, in the wild fig.

Based on observation of this behaviour, cultivators of the Smyrna fig have, since ancient times, solved the problem of fertilization by hanging branches of the wild capri fig among the flowering Smyrna trees. When a female wasp emerges from the

CURIOUS CREATURES

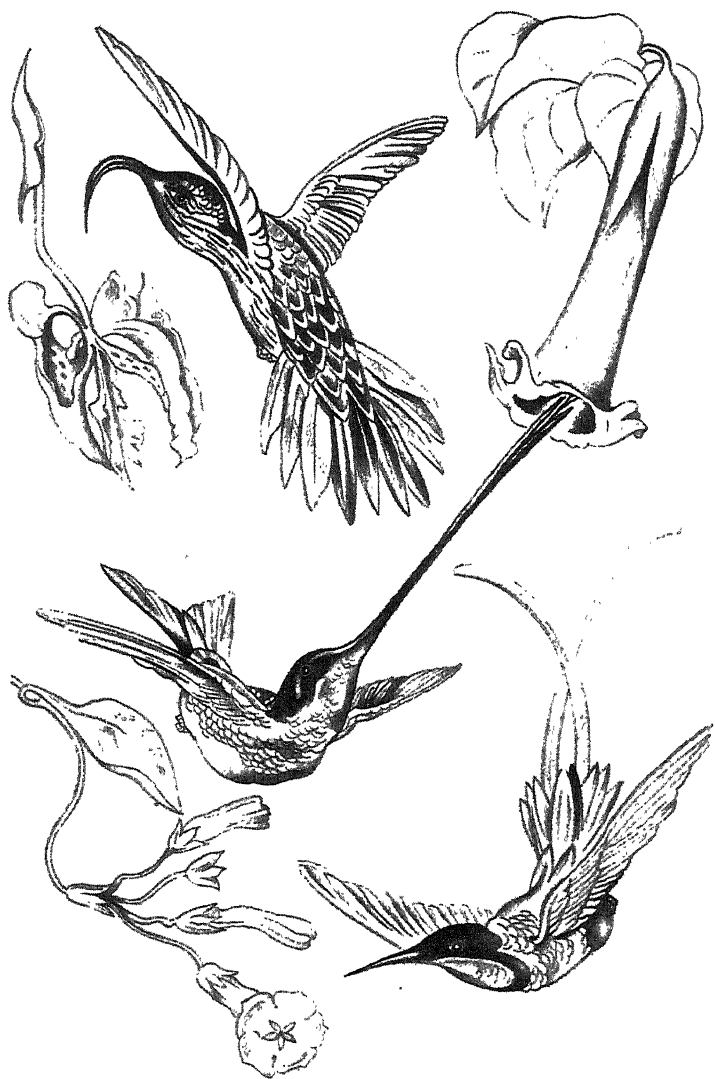
wild fig she eventually enters a flowering, not yet closed, fruit of the cultivated tree only to find that the flowers are of such a shape that she cannot make use of her ovipositor. Crawling about the fig, the adherent pollen from her original home pollinates the flower and when, in due course, she goes in search of a satisfactory fruit in which she can lay her eggs, she leaves the Smyrna fig without having done any harm but a considerable amount of good, carrying out the process known as capri-fication.

The pollinating capacity of *Blastophaga psenes* is so reliable that, in California, the cultivation of the Smyrna fig and of the wild capri fig in which the insect lives are carried on simultaneously.

While the fertilization of a great many flowers is dependent upon the visit of insects, which rival the wind as pollen carriers, there are a few other unusual pollinating agents which play their part in this process.

Among the most beautiful and characteristic of all flower lovers are the fascinating Humming Birds, the *Trochilidae*, of the Americas, which include the smallest birds in existence, some of them measuring only two and a half inches from beak to tail. Over five hundred species of Humming Birds are known and most of them abound near the equator in the vicinity of the Andes. I have often seen them in the higher districts of Peru, swarming like insects and sparkling like exquisite jewels against the background of the snow-covered volcano Misti. Complete masters of the air, they are difficult to watch, being swift in flight, and unique in the rapid efficiency with which they deal with flowers while suspended in mid-air.

Blossoms are attractive to most Humming Birds, which feed on the nectar and the tiny insects captured in the flowers' corollas. Humming Birds, like bees, become dusted with pollen during their feeding and carry it from blossom to blossom, and some species are of great importance to the fertilization of special plants.



HUMMING BIRDS

Above: SICKLEBILL

Centre: SWORD BEARER

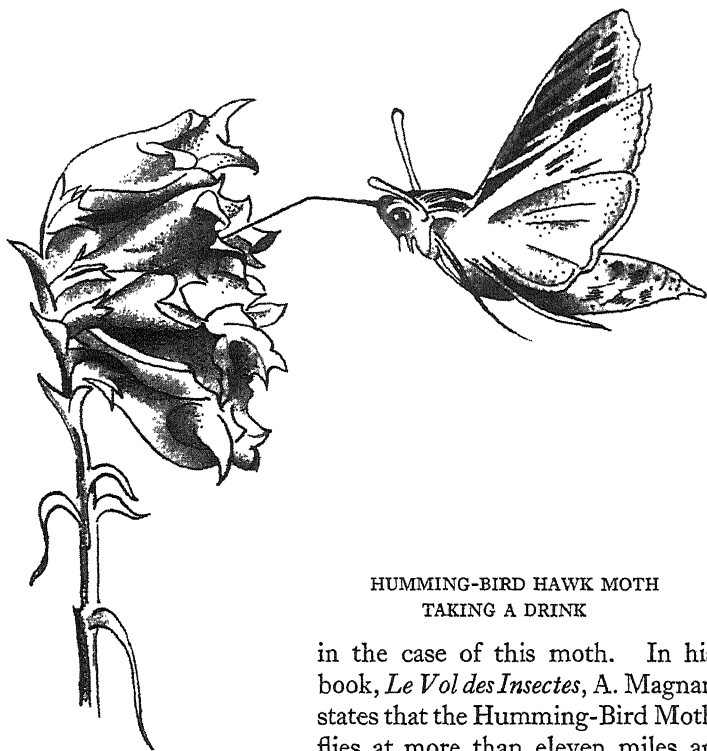
CURIOUS CREATURES

The tubular tongues and the long, slender bills of most Humming Birds are remarkably adapted for exploring blossoms. In the case of the Sicklebills, *Eutoxeres condamini*, however, the beak is so curved that it forms a hoop, which allows the bird to feed only on a few special flowers. The Sword Bearer, *Docimastes ensifer*, has a bill five inches in length, longer than the rest of its body, and consequently selects long trumpet-shaped blossoms.

The name Humming Bird is derived from the whirring humming sound made by the rapidly vibrating wings of the birds in flight. These birds can hover untiringly in front of flowers, while extracting the sweet nectar, or can make quick darting movements to catch insects in the air. Some are even reported to mate on the wing. They are also able to cling with their feet to 'difficult' plants, where they may hang upside down collecting minute organisms with the greatest ease. Humming Birds, contrary to popular belief, do not come out in the evening but feed by day and seem to enjoy flaunting their miniature beauty in brilliant sunshine among luxurious blossoms.

The belief that they feed in the evening is almost certainly due to their being confused with the Humming-Bird Hawk Moth which is about the same size and of which the species *Deilephila lineata* is shown in the illustration. These moths hover at dusk and at night over scented flowers in exactly the same way as the birds do during the day. The long proboscis is pushed to the nectar at the base of the flowers' long corollas, and the slender wings flutter at great speed. The hairy body with flattened tail is the shape of a bird and it is only the antennae on the head which indicate the true nature of the creature. Every summer, reports of the appearance of Humming Birds in England have to be denied because of the confusion between the true Humming Bird and the Humming-Bird Moth.

The speed of all insects is astonishing and it is particularly so



HUMMING-BIRD HAWK MOTH
TAKING A DRINK

in the case of this moth. In his book, *Le Vol des Insectes*, A. Magnan states that the Humming-Bird Moth flies at more than eleven miles an hour, making eighty-five wing-beats per second during which period it covers about five and a half yards.

Of all insects bees are by far the most important flower pollinators, for they not only have to find food for themselves but they have to collect food for the present and future generations in the hive. The beneficial transportation of pollen by the bees is no conscious act on their part, indeed it is purely incidental in their search for food which is the only factor influencing their visits to flowers. Pollen is a great source of proteins and fats, and many flowers also provide a secretion of nectar, a sugary fluid, which, after partial digestion in the bee's crop, is

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regurgitated as honey. Honey-Bees and Bumble-Bees produce wax, which is derived from glands on the underside of the body of young workers.

In gathering nectar and pollen bees do not pursue their way aimlessly, as do butterflies, from one species of flower to another. If a bee starts on michaelmas daisies it will continue to visit only michaelmas daisies throughout the trip and will not change to any other species as long as it can obtain a drop of nectar or pollen. Such constancy makes the bees dependable pollinating agents, and for performing this 'marriage ceremony' with such skill, Honey-Bees have often been called 'the priests of the flowers'.

Whenever plants are in blossom and it is warm enough for the bees to fly, they start out at daybreak and continue until nightfall or until it becomes too cold or too wet. In this way they visit countless numbers of plants where they push their way into the flowers and draw up the nectar through the protruding sucking organ they have. They literally roll in the yellow dust of the blossoms, coating their hairy bodies, and having collected some pollen in the baskets on their hind legs, they either fly on to the next flower or fly back to the hive and then return for more. Whatever they do, they always carry pollen from one flower to the seed germs of another.

Having paid tribute to the wonderful arrangement which serves both plants and creatures so well, it has to be admitted that there is occasionally the intrusion of 'a serpent into this Eden'. In certain flowers the nectar is at the base of a long tube and can be reached only by insects like the Hawk-Moths with their long, 'watch-spring' tongues. Some Bumble-Bees, however, can, as shown in the illustration, overcome this difficulty, having learned to cut holes with their sharp jaws into the lower part of the corolla and so reach the nectar from the side. The Honey-Bee, which cannot with its smooth jaws cut into the flower tissue of the Honeysuckle at all, then revisits the flower and thus obtains a sweet load as well. Neither



BUMBLE-BEE AND HONEY-BEE VISITING HONEYSUCKLE

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stamen nor stigma are touched so, in this exceptional case, the mechanism of the flower is defeated.

One of the fundamental differences between animal and plant life is the method of feeding. Animals use as food substances that are either plant or animal matter, whereas plants obtain all the sustenance required from the air, soil and water.

A small number of plants are, however, exceptions to this general rule in that they have adapted a partially animal diet consisting mainly of small insects. Most of them are found in boggy places where the soil is extremely acid and poor and is, above all, deficient in nitrogenous salts which are essential to the well-being and proper growth of the higher plants.

About five hundred kinds of insect-eating plants are known and one of the most striking forms, common in tropical forests, is the Pitcher Plant, *Nepenthes*. The tips of the drooping leaves are prolonged into tendrils bearing brightly-coloured pitchers, each of which is finished with a delicately poised lid and a strengthened rim. Nectar is produced round the sharply curled rim and insects come to sip it, but as they walk in they find that the surface becomes very slippery and they slide to the bottom of the pitcher where they are drowned in a copious liquid secretion. The plant then absorbs the products of their decay and, since the body of an insect is rich in nitrogen, makes up for the essential salts it is unable to obtain through its roots.

Some pitcher plants may be as much as eighteen inches long and the amount of liquid secretion, often diluted by rain water but apparently not less efficacious, would be enough to drown a small bird. The deadly danger of such leaf-ponds has nevertheless been outwitted by a small mosquito, which, attracted by the microscopic food particles in the water, flits into the open pitcher like a helicopter and lays its eggs on the water surface. It then quickly rises and escapes. The eggs, however, hatch and the wrigglers, unharmed by the plant's digestive juices, feed on the micro-organisms that congregate over the drowned bodies of other insects. They grow, pupate



PITCHER PLANT WITH INSECTS APPROACHING THE FATAL ENTRANCE

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to a bullhead and after finally emerging take to the open air. *Wyeomyia* is the only kind of mosquito that makes use of the water collected in the Pitcher Plant leaves and its wrigglers are found only in these restricted niches. This very interesting act has been described by Lorus J. and Margery J. Milne of the University of New Hampshire.

In 1860 Darwin discovered at Hartfield, in Surrey, that many insects were constantly becoming entangled and entrapped among the leaves of a small flat-growing plant called sundew or, botanically, *Drosera*. This incident led to investigation in an entirely new field and the fruits of Darwin's intensive labours in this direction appeared fifteen years later in his book *Insectivorous Plants*.

Among the many plants examined was Venus's Fly Trap, *Dionaea muscipula*, to which Darwin assigned, on account of its amazing functions, the title of 'the world's most wonderful flower'. This plant, a native of the marshes of North Carolina, is not unlike the sundew in general appearance and manner of growth, each fly-trap-leaf forming a roundish blade divided by a midrib into symmetrical folding halves. The two halves, each with three stiff sensitive bristles in the middle, are held open. Should, however, one of the bristles be touched, the two spiked jaws of the leaf close with a snap and anything, such as an insect, that may have brushed against the bristles is held in a vice-like grip, comparable with the action of a gin trap.

After the insect is caught, the glands on the surface of the two blades pour out their digestive fluids in which the insect is slowly dissolved, the proteins absorbed into the leaf supplying extra nitrogen to the plant, a process exactly similar to that which goes on in the stomach of an animal after a meal. A week may be required for this assimilation, after which the leaf re-opens ready for the next meal. Indigestible matter, such as small stones, is rejected.

A number of plants similar to Venus's Fly Trap are found in warmer countries, and some of the larger species are so well



VENUS'S FLY TRAP

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endowed with glandular secretions that they are hung up by the peasants and used as fly-papers.

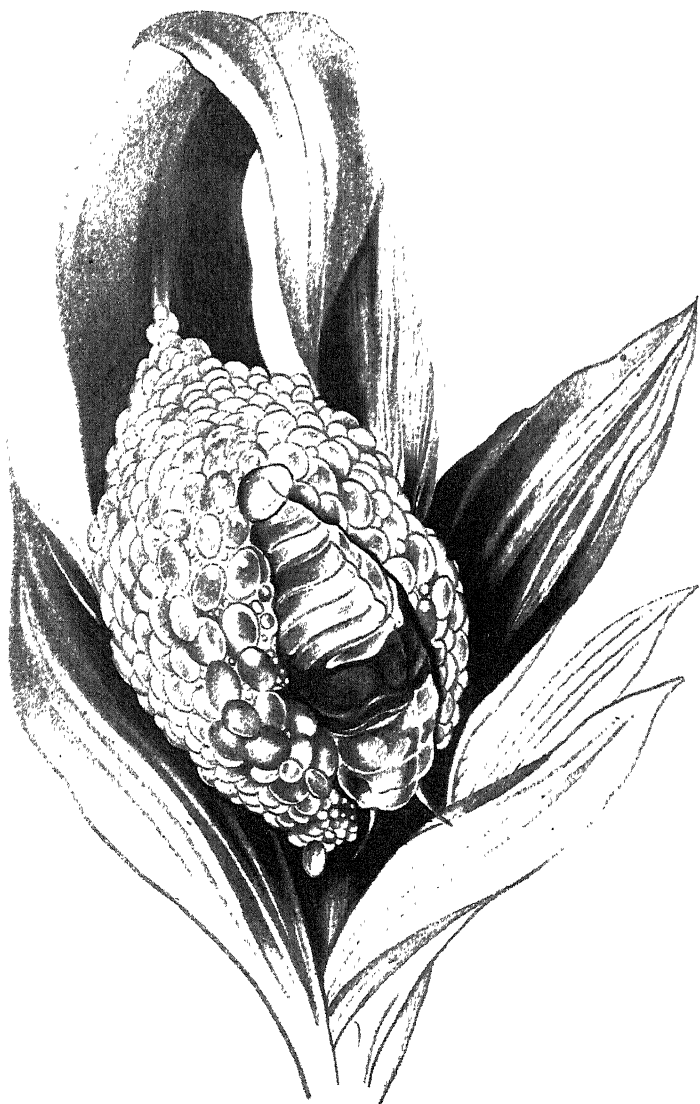
The use of protective coverings from plant matter is quite common among a variety of insects. Some caterpillars roll the leaves of the plant upon which they feed into tubular shelters in which they are able to feed in concealment. A very unusual kind of covering is the froth made by the *Cercopidae*, or Frog-hoppers, which establish themselves on plants. These insects get their popular name from their broad heads which give them a froglike appearance and from their partiality for leaping.

The Froghopper begins life as a soft-bodied bug less than a quarter of an inch in length, and soon after birth begins secreting a liquid. Hanging from blades of grass or stems of plants, always upside down, he ejects bubbles from a channel beneath his body and by moving his abdomen up and down eventually completely covers himself with froth. This tiny mass of froth is popularly known as 'cuckoo-spit' and the fluid which forms the bubbles is of a resistant sticky texture.

The production of this spume or froth has led to much speculation. It appears to protect the soft bodies of the nymphs from desiccation and it may also, to some extent, guard the helpless youngsters from predatory enemies although some species of wasps have been known to penetrate these defences. However this may be, it is known that the unharmed and snugly hidden Cercopid remains in the bubble-fortress throughout all his moults. He sucks juice from the plant for sustenance until, reaching the adult stage, he is ready to emerge complete with grown wings and legs with which he can jump.

Froghoppers are found all over Europe, Middle Asia, Siberia, North America and Japan. They affect a wide range of wild and cultivated plants and grasses, and the most common species is *Philaenus spumarius*, which can produce his frothy home in only fifteen minutes.

The insect world is largely dominated by the females, and in this realm one generation knows little or nothing about the



BABY FROGHOPPER COVERING ITSELF WITH FROTH

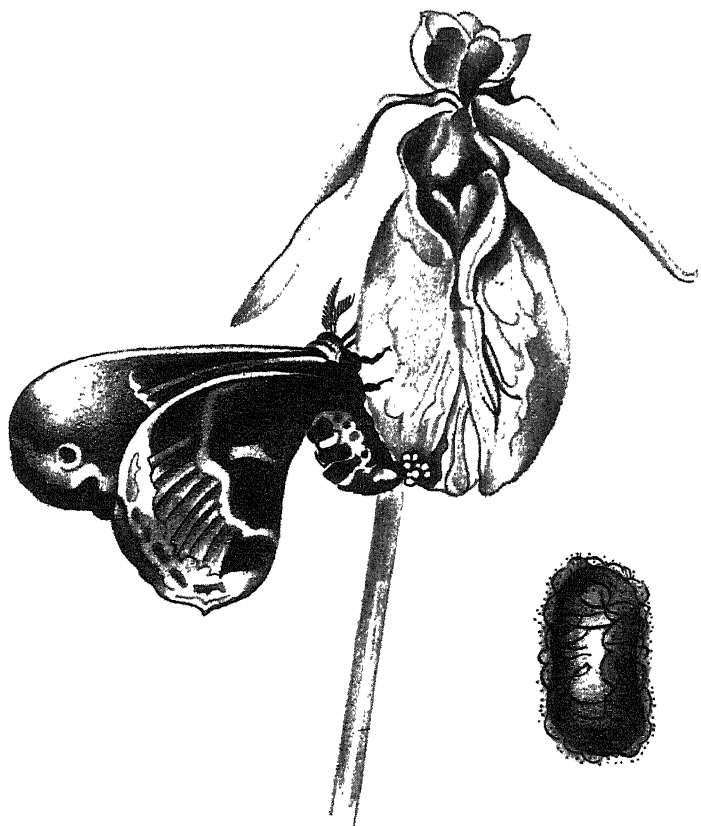
CURIOUS CREATURES

next; the individual, playing its small but important part in Nature's plan, just eats, reproduces and dies.

The illustration of the Promethea Moth, *Callosamia promethea*, shows the first and last stages in the existence of this beautiful creature. In the course of a few days this moth with the graceful, fernlike antennae is born, mates, reproduces and dies. Like all silk moths she has no mouth. Emerging from the cocoon guided by an amazing sense of smell she is found by her mate and pairing takes place. Her eggs she sometimes deposits on the plant known as Lady's Slipper. The eggs soon develop and the caterpillar spins its silk cocoon into a leaf of a deciduous tree to render it less conspicuous. To keep the leaf from falling or being blown down in the autumn gales the caterpillar, before the metamorphosis, spins a sleeve of tough silk around the stem of the leaf and the twig. Thus well secured the pupa remains in the leaf for the winter and emerges in May or June.

There are a number of moths whose caterpillars spin silk casings or cocoons to cover themselves in the chrysalis stage. Most of the silk we use, however, comes from the cocoon of the cultivated Chinese Silk Moth, *Bombyx mori*. The caterpillars of these moths are carefully reared in cool, airy shelters and fed on mulberry leaves. When a caterpillar begins to spin it passes out from its spinnerets a sticky fluid which hardens on coming into contact with the air and forms a thread of silk. It takes the larva from three to four days to complete the cocoon and when the thread is later unwound it may be up to a thousand yards in length. In order to get the silk it is, however, necessary to kill the animal within the cocoon for if this is not done the moth destroys one end of the cocoon on emerging. So the moth is speedily killed in boiling water or dry heat and, after the loose silk is cleared away, the end of the thread is found and unwound. Threads from about 25,000 cocoons are necessary to make one pound of silk, yet, in spite of these fantastic figures, Japan alone used to ship six million pounds of silk every year to the United States.

ANIMALS AND PLANTS



A PROMETHEA SILK MOTH DEPOSITING HER EGGS ON A LADY'S SLIPPER
AND THE COCOON OF THE CULTIVATED CHINESE SILK MOTH

Nature invented the cocoon for the moth, but man has subordinated the moth to the cocoon, with the result that the cultivated silk moth has in effect become a domesticated animal and has lost the power of flight. The Chinese are known to have made use of silk as early as 2600 B.C.; from China the art was carried to Japan which, before the last war, produced a very large proportion of the world's supply of raw silk.

CURIOUS CREATURES

The presence of lice on the bodies of animals is, of course, well known, but plants too suffer from lice known as *Aphididae*. There are about 2000 known species and of these 450 are known in Britain, among them many notorious enemies of cultivated plants such as the Green Fly and the Black Fly.

The widespread ravages of the Aphides and the destruction that they cause are a direct consequence of their fantastic reproductive capacity. They hatch from eggs in the spring as wingless females which sink their piercing beaks into a plant and suck the juices. Soon these females give birth to more live females which continue the process until vast numbers of wingless female Aphides have been reared. A single female may produce young at the rate of one every half-hour. Should food become scarce females with wings are born and these fly away to other plants to start once again the production of series of wingless females. Laboratory tests have shown that sometimes as many as a hundred generations go by without the appearance of a male Aphis. It is only towards the end of the summer that both males and true females appear and the form of breeding then changes to the laying of eggs which remain dormant during the winter to hatch in the spring and continue the amazing reproductive cycle.

In all probability there is no other living creature approaching this speed of reproduction, and Dr. Julian Huxley has said that if the offspring of one Aphis could reproduce for a single season with all natural barriers removed then the progeny would be so numerous that they could cover the entire Earth with a layer of plant lice.

Fortunately for gardens and farms natural barriers do exist and the enemies of the *Aphididae* are legion. If this were not so then the small, feeble unarmed plant-louse would indeed inherit the Earth. Its destructive capacities were demonstrated half a century ago when the grape-aphides swept across the vineyards of France. Before they could be checked two million acres of vines had been laid waste.



LADYBIRD BEETLE RESTING
AFTER HUNTING PLANT LICE

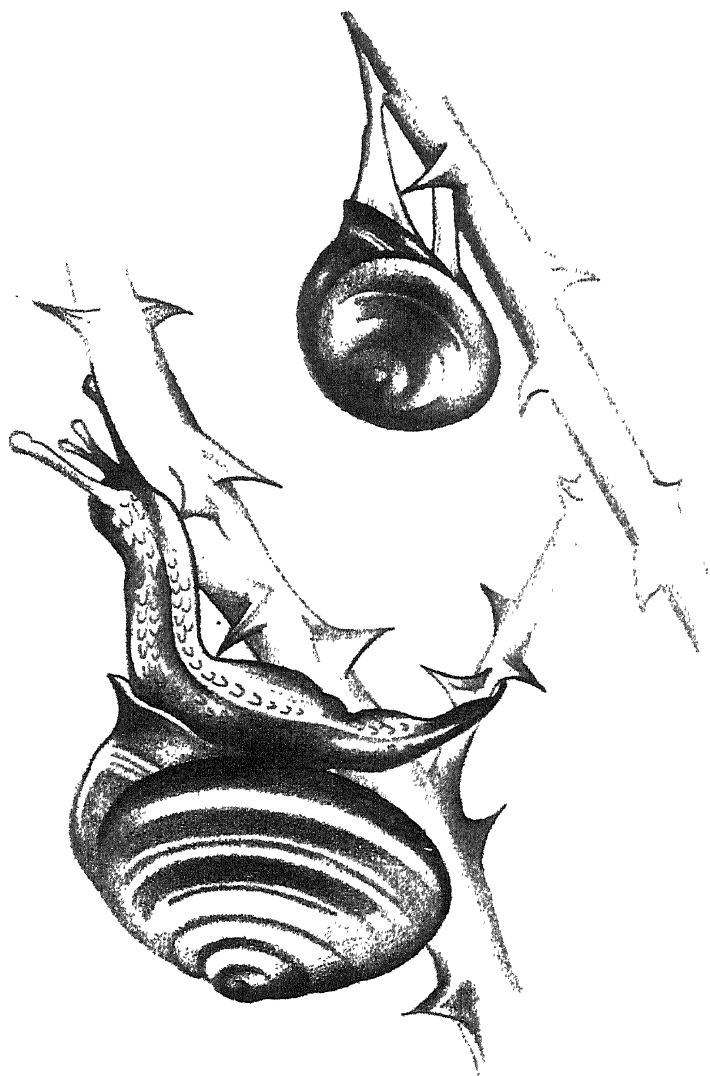
CURIOUS CREATURES

Among the most important enemies of the Aphides is the red, black and white Ladybird Beetle. Because of its ceaseless war against the pest the ladybird is one of the best-liked insects in the world and in some parts is held in almost religious veneration as its name implies, dating back as it does to the distant past when the insect was dedicated to 'Our Lady the Blessed Virgin'.

Ladybirds and their larvae are predominantly carnivorous in habit, the ferocious larva alone being supposed to eat between thirty and forty plant-lice in an hour. The importance of the Ladybird to agriculture can be demonstrated by the story of the Californian citrus industry at the end of the nineteenth century. At this time a new species of orange tree was imported from Australia and on arrival at the Golden Gate in San Francisco it had brought with it an insect called cottony-cushion scale which swiftly swept through the Californian orange groves leaving behind a trail of dead and dying trees. The scientist Albert Koebele, searching for the natural enemy of this insect in Australia, discovered a native Ladybird Beetle which fed exclusively on cottony-cushion scales. A colony of these beetles was caught and immediately dispatched to California where 129 arrived alive. This Australian ladybird-battalion reproduced so rapidly that in two years the menace of the cottony-cushion scale was defeated, and an industry worth a hundred million dollars a year was saved.

Living on different kinds of pests ladybirds all over the world are collected and put to work on orchards and on farms. The Swedes sometimes call them 'Virgin Mary's Golden Hens', French peasants speak of them as 'the Cows of the Lord', but whatever the name given to them there is no doubt that their huge appetites for pests have made them one of the most popular insects known to man.

Plants have evolved many methods of overcoming the attacks of enemies, of which snails are among the most formidable. For instance, thorns and prickles are two such methods. On



HOW SNAILS OVERCOME THE PROTECTIVE
MEASURES OF PLANTS

CURIOUS CREATURES

the other hand the snails have taken counter measures to deal with such obstacles in their search for food.

In the illustration a Garden Snail is shown climbing over the armed stem of a briar by covering the harmful surface with slime. It can no doubt deal equally well and effectively with the dangerous thistle leaves. Experiments with slugs have shown that they are so well protected by the slime that they can move over the edge of a razor blade without hurt.

One of the most remarkable things about a snail is its method of eating. When the jaws are opened a wonderfully-fashioned tongue, rather like a rasp, comes into operation. The snail goes to work with a side-to-side movement of the head and the rasp-like tongue cuts the leaves into fine pieces. The tongue of the common garden snail has 135 rows of 105 teeth, making a total of 14,175 teeth.

Carrying their homes with them snails need only find some damp spot where they can rest inconspicuously, they then sleep in their shells throughout the whole winter. Lack of moisture is their only fear, otherwise life is very simple compared with the lot of many other creatures. Some species have a lid or operculum with which to close the entrance to their shells, while others produce the same effect with a layer of slime.

The strangest feature of these gastropods is undoubtedly the fact that they are hermaphrodites, i.e. they have both male and female organs in the same individual, so that each fully grown snail contributes to the increase of the colony as a result of mutual fertilization. In some species of these bisexual animals the organs are so placed that the creatures may act as female partner to one snail and male partner to another at the same time, forming the chains which, hanging on trees or bushes, are often seen in gardens. Most snails lay eggs and live from two to five years.

In concluding this chapter it would perhaps be unfair not to draw attention to the fact that snails, labelled as notorious enemies of plants, do sometimes act as friendly seed-spreaders.

ANIMALS AND PLANTS

They are attracted to a white, fleshy band attached to fallen seeds of a wild British plant, *Hellebore*. This appendix is the oily body, or 'elaisome', which the snails eat for the oil. The remaining seeds stick to the snail's slimy skin and are dispersed as the snail travels along at its usual pace. This mobile animal thus presents yet another illustration of the complex inter-relationship of plants and animals.

WHAT COMES OUT OF AN EGG

MULTICELLULAR creatures, whose bodies are made up of a greater or lesser number of cells packed like bricks in a wall, start as a single fertilized egg-cell. The egg-cell proceeds from the female parent and it is fertilized by the sperm-cell emanating from the male. The egg is formed after a special part of its protoplasm, called the nucleus, has fused with that of the much smaller spermatozoon or sperm-cell.

We all hatch from eggs, but in most mammals the eggs develop and hatch within the body of the mother, and the young are born in a more or less advanced condition. In primitive mammals, however, eggs are laid, the young develop within them, feeding upon the yolk stored up in the egg, and eventually hatch out. After hatching they feed on milk secreted by the mother, but the milk comes from a number of small pores and not, as in other more developed mammals, from teats.

The Duckbill, or Platypus, and the Spiny Anteater, or *Echidna*, are the only existing egg-laying mammals. Both are to be found only in the Australian region.

The Duckbill, *Ornithorhynchus anatinus*, though occasionally, and humorously, referred to as half-bird half-mammal, is nevertheless a true mammal. The jaws and the front of the face project as a rubbery or horny duck-like 'bill' and are covered with a hairless, tough skin. The toothless, highly sensitive bill of the adults is about two and a half inches long and is used to stir up the mud at the bottom of the rivers, or to capture insects, worms or crayfish.

The fur of the Duckbill, which is close and velvety, is of a dark grey-brown colour. The tail is short and covered with

WHAT COMES OUT OF AN EGG



DUCKBILL OR PLATYPUS

bristly hairs; the feet are webbed for swimming; and on the inner side of each hind leg of the male there is a hollow, horny spur connected with a poison gland, but it is only under extreme provocation that the Platypus uses this formidable weapon. The Platypus is in fact the only furred creature carrying venom spurs.

The male Platypus is about twenty-four inches in length, the female being slightly smaller. They construct burrows in the banks of streams and rivers which may be thirty feet or more in length and have, usually, two entrances above the surface of the water. At the end of the burrow in an enlarged chamber the nest, made of grass, leaves, rootlets and reeds, is placed, and here two or three eggs, the maximum size of which is not more

CURIOUS CREATURES

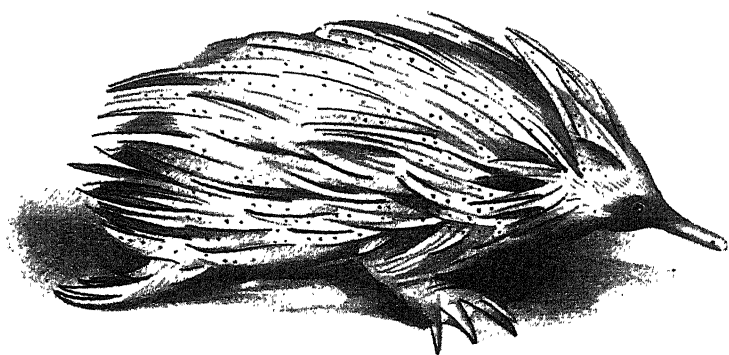
than seven-tenths of an inch, are laid. These eggs have white leathery shells covered by a viscous substance and it is estimated that with the warmth of the mother's body they hatch in about two weeks. When hatched the young are blind and have no fur—are naked in fact—and the mother in a rolled-up attitude, holds them to her abdomen so that they may feed on the milk from her mammary glands. The baby Platypus is a singularly helpless creature, more helpless than a human baby, and is nursed by its mother until it is almost fully grown.

Some very important new facts about the life and habits of the Platypus have recently been published in Australia. In his book *We breed the Platypus*, David Fleay, most eminent of the younger generation of 'Platypus Men', gives a most vivid description of his successful experiments. Among the many remarkable features of the 'most wonderful of all living mammals', Mr. Fleay particularly mentions the gluttonous and expensive appetite. The composition of a test feed, given in one single night in the Platypus sanctuary, included four hundred large earthworms, three hundred and thirty-eight beetle grubs, and thirty-eight small crayfish, the total weight of that feed being one and three quarter pounds. Since the maximum live weight of the nursing female, to whom this feed was given, was only two pounds, digestion must have taken place almost concurrently with feeding. Maintenance of extreme activity — swimming, digging and giving milk to the young Platypus — necessitates relatively very large amounts of easily assimilated food. In referring to this 'five-dollar dinner' Mr. Fleay very rightly concludes: 'What a terrific time mother Platypuses must have in their wild state! Little wonder that some baby animals leave the nesting burrows too soon.'

The other egg-laying mammals are the Spiny Ant-eaters of Australia, Tasmania and New Guinea. These are heavy-bodied animals with short, sharp spines and hair covering their skins. They are almost tailless, but have elongated snouts from which they may produce a long sticky tongue which is used to capture

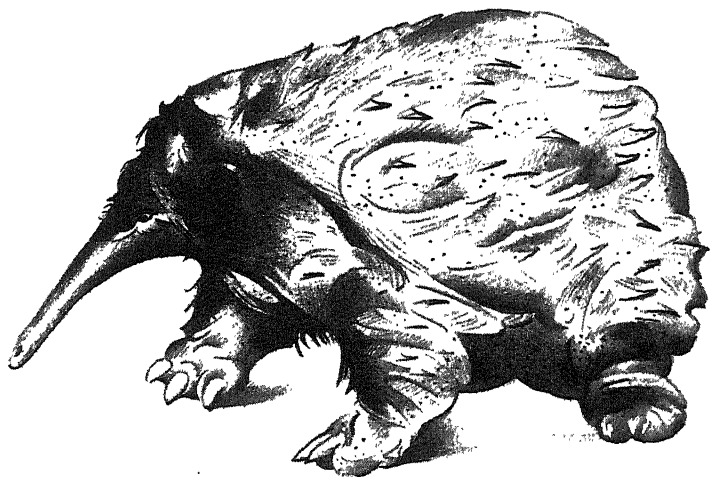


NEST WITH YOUNG DUCKBILLS



ECHIDNA OR STRAIGHT-BEAKED SPINY ANT-EATER
Above: FEMALE SHOWING POUCH

WHAT COMES OUT OF AN EGG



BLACK-SPINED ANT-EATER

ants and other insects. As in the Platypus, teeth are absent, but whereas the Platypus lays its eggs in a nest the Spiny Ant-eater carries and hatches them in a pouch.

The Echidna or Straight-Beaked Spiny Ant-eater, *Echidna aculeata*, frequents dry and elevated situations and is to be found in timbered districts of Eastern Australia. A variety of *Echidna aculeata* is also found in Tasmania. The size varies with the different species but on the average it is comparable with a very large hedgehog, from fifteen to twenty inches in length. Like the hedgehog it can roll itself into a ball, its spiny coat serving as a protection against enemies. Two eggs are laid, each approximately the size of a sparrow's egg and with a white leathery shell like the egg of a reptile. These eggs are placed in a pouch on the underside of the body. After hatching, the young remain in the pouch for a few weeks until they are about three or four inches in length.

The Black-Spined Ant-eater, *Proechidna nigroaculeata*, is a much larger and heavier animal, found in the mountainous

CURIOUS CREATURES

area of New Guinea. It has a very elongated, slender snout, and the bristly hair of its body is interspersed with thick black spikes.

The velvet-coated Duckbill and these Spiny Ant-eaters, which lay eggs and suckle their young, are undoubtedly the most primitive mammals in existence today. With their strange habits, their bird-like beaks and elongated snouts they provide a glimpse into the dim and mysterious past from which mammals evolved.

The eggs of reptiles are generally proportionally smaller than those of birds. The eggs of a Crocodile, for instance, are similar in size to those of the goose.

Crocodiles lay numerous eggs which are heavy, oval and hard-shelled. They are usually deposited in a hole in the sand or in the middle of a mound of vegetable debris, in the neighbourhood of water. It takes the tropical sun about eight weeks to hatch out the eggs and the mother may defend savagely both the eggs and the young from attacks of enemies. When breaking out of the shell the young Crocodile makes use of a sharp egg tooth which it sheds a few hours later. A barking noise from inside the egg is said to presage the breaking out and to attract the attention of the mother, bringing her back to the nest. Baby Crocodiles are hatched in a lively and vigorous condition and are able to snap fiercely almost before they leave the shell. They are only a few inches long but are taken immediately to the water by the mother since large birds of prey often attack and eat them.

The Crocodile is the largest reptile in the world and is known to have reached an age of a hundred years. It is found in Africa and Asia and differs from the Alligator of the New World in that the fourth tooth of the lower jaw fits into an external notch in the upper jaw and consequently is visible when the mouth is closed whereas in the case of the Alligator this tooth fits into a pit in the upper jaw and cannot be seen when the mouth is shut. In general, too, the snout of the Crocodile is longer than that of

WHAT COMES OUT OF AN EGG

the Alligator. And Crocodiles grow to an immense length, the largest species being recorded as measuring over thirty feet, while Alligators do not generally exceed twelve feet.

Like the Elephant, the Crocodile when fully grown has no real enemy other than man. Its chief food is fish, but when the opportunity occurs Crocodiles will eat human beings. This usually happens when they are unable to obtain their usual food



CROCODILE EMERGING FROM THE SHELL

CURIOUS CREATURES

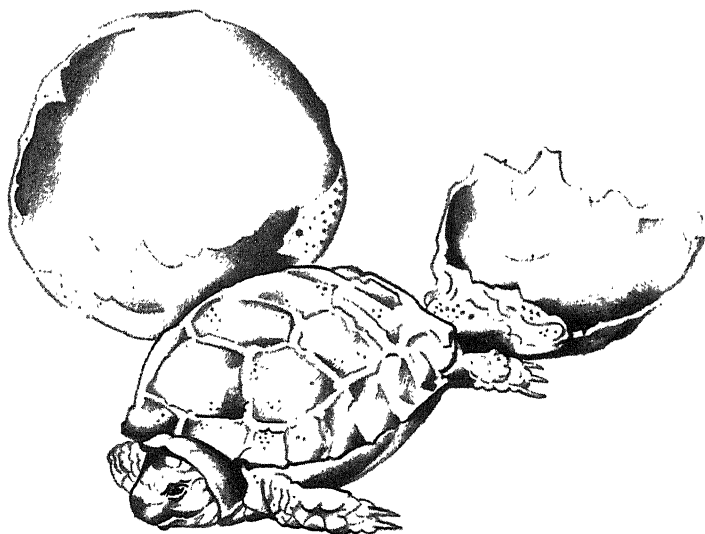
and therefore have to go in search of other prey. Waiting for their quarry they are almost invisible, for the nostrils and eyes raised on top of the head, are all that appear above the water level. Having once tasted human flesh they may well become much more dangerous. Dogs, too, have been killed and eaten. Cattle, goats, antelopes, monkeys and baboons, drinking from the river bank, may be caught and drowned and it has been known, on one occasion, for a very large Crocodile to pull even a rhinoceros down into the water.

Crocodiles, like many other reptiles, do not require food very often and can live for a considerable time without eating. Many species hibernate in the mud during winter, others pass into a state of coma when the pools dry up. Nevertheless they do sometimes attack their own kind and a great number of young are eaten by fully-grown Crocodiles, while a badly hurt animal may well become an easy and welcome prey for its own relatives.

On land the Crocodile moves slowly, but it can, when frightened, move surprisingly fast to hide in the water. Water is really its natural home and here it can swim with great speed, using its long, powerful tail to propel itself along. The ears are covered by a flap and the nostrils can be closed on submerging. A nictitating membrane which is a kind of transparent eyelid protects the eye, giving clear vision as the animal pursues its prey. As the nasal passage opens far back, water cannot enter into the windpipe while the Crocodile, with its nostrils above water level, is swallowing its drowned victim beneath the surface.

More feared than admired, the Crocodile has, nevertheless, one valuable little friend. This is the little Crocodile Bird which picks its teeth. The strange association between the Nile Crocodile and the Egyptian Plover was noted long ago by Herodotus. Great ugly Crocodiles lying on sandbanks or rocks, with their huge mouths wide open, with these birds going right inside to feed on the small bits of food left between the sharp, vicious-looking teeth after a meal, must be an amazing sight.

WHAT COMES OUT OF AN EGG



YOUNG LAND TORTOISE EMERGING FROM
SPHERICAL EGG SHELL

All Turtles and Tortoises, which belong to the order of Chelonians, lay white eggs with stout shells which in some species are hard and thick and in others more leathery. The females usually make a hole in the ground in which to lay their eggs in some well-chosen locality to which they return year after year. They take great pains to cover up the eggs and to remove as far as possible all traces of their presence, a necessary precaution for the eggs are a favourite food of many different kinds of animals.

The young Land Tortoise, which is shown in the illustration as just emerging from its almost spherical shell, is a native of the hot regions of Africa. As with all newly-hatched tortoises the shell is at first soft and leathery, hardening as time goes on. Tortoises grow very slowly but they increase their bulk continuously throughout life. The adults of this African species are

CURIOUS CREATURES

often three feet long, measured across the back-shell, or carapace, but the Giant Tortoises of the Galapagos Islands are even bigger, sometimes weighing as much as five hundred pounds, and their eggs are the size of tennis balls. Once so numerous that it was possible to walk a hundred paces across their densely packed shells without setting foot on the ground, they have now been almost exterminated through constant pursuit by man.

All Land Tortoises are vegetarian and the shell is generally large and high-domed so that the animal can withdraw into it completely. Compared with fossil tortoises the living species have changed very little during their slow evolution, apart from discarding their teeth. No present-day tortoise or turtle has teeth, the jaws being covered with a horny beak which generally has sharp cutting edges. The females have no voice and can only hiss, but the males, especially during the mating season, can pipe or bellow according to their size.

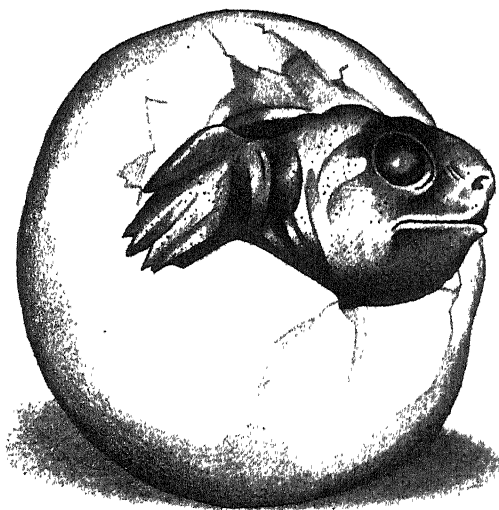
Giant Tortoises probably live longer than any other animal. One specimen is known to have lived for a hundred and twenty years in the barracks at Port Louis in Mauritius. The late Lord Rothschild at one time made quite a collection of Giant Tortoises and in his museum at Tring there are several specimens each weighing over five hundred and fifty pounds; it is estimated that one of them must have existed at least two hundred years. Another monster, reported still living on the island of St. Helena, is known to have been almost the same size as it is now when it was a contemporary of Napoleon in his exile.

Turtles differ from tortoises in that they live in water. They are carnivorous in habit, feeding mainly on fish. Being aquatic animals they leave the sea, the rivers or the ponds only during the mating season and then the females will often wander considerable distances inland to lay their eggs in communal nests, after which they return to the water, leaving the hatching of the eggs to the sun and the fate of the young to the chances of Nature.

The infant Common Snapping Turtle, *Chelydra serpentina*,

WHAT COMES OUT OF AN EGG

of the Eastern United States is shown just thrusting its head out of the shell. Before very long it will have wriggled itself free and will then join its twenty or so brothers and sisters in the nearest pond. If it is fortunate it will escape its many enemies such as the Herons and the Bullfrogs which are only too keen to feed on the helpless soft-bodied creatures. Nature grants to each member



BABY SNAPPING TURTLE

of the chelonian tribe slow maturity and the possibility of a long life, a possibility dependent upon its ability to overcome the dangers of its early existence.

The world of the Snapping Turtle is a muddy and watery one, a place of ooze and slime, of weeds and rotting logs. In these dim and silent ponds the animal loves to float on the surface with the tip of its snout sticking out like an alligator. Its yellow-black eyes are set so close to the nose that it can see and breathe while exposing only very little of its body.

This turtle, having no temperature-regulating device, heats or cools with its surroundings. Each October its metabolism is slowed down by the onset of winter so it burrows itself below the frost-line in the mud at the bottom of the pool. During its enforced hibernation, the turtle subsists on the fat it has accumulated in the preceding summer and waits until the spring sun has warmed the water sufficiently for it to be able to resume its normal activities.

CURIOUS CREATURES

Belonging to the most ferocious species of the whole Turtle tribe, the Snapping Turtle sets out in the spring with deadly intent and precision to satisfy its hunger. When snapping, the head darts out like a flash and the sharp jaws close with such force that no prey, once caught, can escape. Large specimens have been known to pull down young ducks and muskrats from the surface of the water. When lying on the bottom of the pond these reptiles use two white wormlike outgrowths of the lower jaw as a lure to catch fish, frogs and any other living thing not too large to be swallowed.

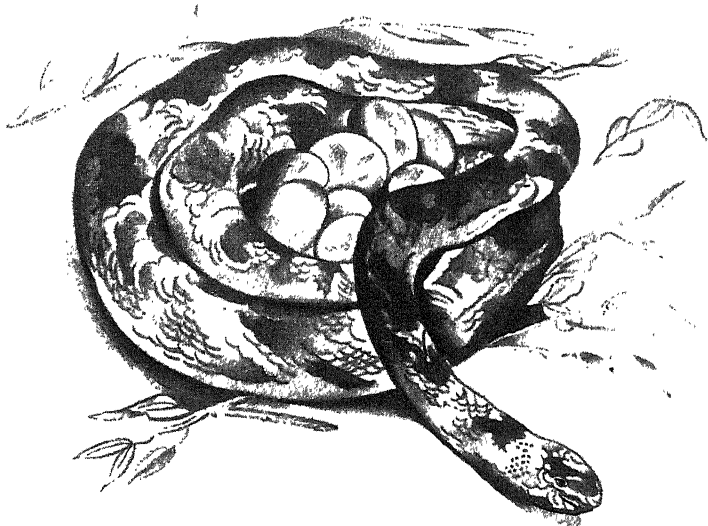
The large species, which attains a weight of close to a hundred pounds, is called the Giant Alligator Snapper on account of the elongated tail, scaly and crested along the upper ridge. This tail is longer than that of any ordinary tortoise or turtle. Snapping Turtles are exclusively confined to the New World, although there is evidence that an allied species once inhabited Europe in an earlier stage of the world's history.

The eggs of reptiles are always laid in large numbers, a clutch consisting of anything from twenty to two hundred. Many reptiles do not brood because it would be quite impossible for them to cover such a large clutch with their bodies.

An exception to this general rule is the American Pine or Bull Snake, *Pituophis sayi*, which has evolved a higher form of brood care. This powerful snake, having stacked her creamy white eggs in a convenient pile of a dozen or more, coils herself around them and, with maternal solicitude, broods over her treasures for about three months. Pythons also incubate their eggs in a similar manner.

The Bull Snake is not poisonous. It is a pugnacious constrictor that captures, crushes to death, and swallows enormous numbers of harmful rodents such as rats, mice, ground squirrels and rabbits. It may reach a length of almost nine feet and is considered to be the most valuable serpent in the central wheat belt of the United States. It is yellowish-brown in colour with a row of large rectangular reddish-brown or black blotches on

WHAT COMES OUT OF AN EGG



AMERICAN PINE OR BULL SNAKE IN BROODING POSITION

the back and sides; it is a powerful hisser and may be heard at a distance of over fifty feet.

Like most snakes it is fond of birds' eggs, and Mr. Raymond L. Ditmars has given a fascinating account of the way it deals with the hard egg-shells. When the egg has passed about a foot down the throat the Bull Snake presses its body firmly against the ground, contracts the muscles and so breaks the egg. The action is quite deliberate and takes a full ten seconds. The egg collapses with a discernable crunch and the fragments of the shell are swallowed.

The Giant Land Snail, *Borus oblongatus*, is found in Brazil. The shell measures several inches in length; the head is provided with two pairs of tentacles, the lower short ones being used as feelers, and the long upper ones having an eye on each tip. This can be seen quite clearly when, in search of food, mainly vegetable matter, the body projects from the shell.

CURIOUS CREATURES



GIANT LAND SNAIL WITH ITS EGGS

Giant Snails lay eggs which are similar to birds' eggs. The covering contains lime and so can rightly be called an egg shell. The most familiar kind are as long, though not as broad, as a sparrow's egg with a pure matt white surface. The bigger ones, however, laid by larger species are highly polished, and the African Land Snail, *Achatina achatina*, which has a shell over seven inches in length, lays eggs measuring anything up to three-quarters of an inch long, comparable in size with a pigeon's egg.

It would be wrong to conclude this chapter without referring to the daily miracle which most of us take for granted. The domestic fowl does not lay eggs only for our breakfasts. Fertilized eggs, each no more than a single cell heavily charged with yolk and contained in a limy shell, are hatched and, as shown in the illustration, a chicken is just emerging after twenty-one days incubation, able to feed itself at once. This, to some of us,

WHAT COMES OUT OF AN EGG

is rather more important perhaps than the characteristic features of the eggs of some rather curious creatures that have been depicted in this chapter.



CHICKEN EMERGING FROM EGG
OF THE DOMESTIC FOWL

FOUR-FOOTED CREATURES
THAT FLY

THESE are perhaps more than a million different animals and each one has its own methods of finding food and its own methods of avoiding being eaten as food by other animals. Flight through the air is one excellent way of escaping pursuers which cannot fly and, in addition, it opens up a new approach to supplies of food which might not otherwise be attainable.

Flying animals may, broadly speaking, be divided into two groups; there are those which fly by using upward and downward strokes of wings powered by muscular action, such as insects, birds and bats; then there are those whose flight is merely a prolonged leap dependent for its extent upon the initial impetus and the span of the gliding membranes, into which group come the various kinds of flying fish, flying lizards, flying frogs, flying squirrels and flying phalangers.

The little Flying Lizard, *Draco volans*, is a brightly-coloured reptile of which more than twenty species are known in tropical Asia. It has on each side of the body loose skin which is extended, supported by long and slender ribs, to form a sheet-like membrane. Like the hood of the cobra it can be folded back against the sides of the body.

These animals, of which the largest species are barely fifteen inches long, live in the trees and run along the branches, with their wings folded, in search of insects. In pursuit of a butterfly they suddenly spread their wings like a parachute and glide obliquely down from bough to bough or from tree to tree. They are, with this unique structure, the only living 'flying reptiles'.



FLYING LIZARDS

CURIOUS CREATURES



FLYING FROG OF JAVA

Tree frogs are astonishing acrobats and their conquest of the trees has undoubtedly placed them beyond the reach of many earth-bound enemies. They have developed suckers at the tips of finger and toes, so that they can climb tree trunks with ease. On the other hand they still have to take drastic action to avoid numbers of other enemies, among which the tree snakes are the most vicious. These snakes

throw themselves into the air from trees, keeping the body straight and drawing in the ventral scales so that the underside of the body is concave, increasing resistance to the air through which they glide downwards towards their prey. It is hardly surprising, therefore, that some arboreal frogs have developed the art of parachuting as a means of escape from the dangers to which they are exposed.

The Flying Frog of Java, *Rhacophorus reinwardti*, has evolved some very characteristic features, and both the long front and back feet are fully webbed. This beautiful green frog, with dark blotches, is able to make extensive gliding flights and M. O. P. Ayyanger has described how one species of the South Indian Flying Frogs sailed in a slanting direction from a high tree and landed about forty feet away. The flight was so swift that the observer mistook the animal for a bird and discovered that it was in fact a frog only after capturing it.

Countless varieties of animals live in the vast, dense tropical



SHORT-HEADED PHALANGER AND YOUNG

CURIOUS CREATURES

forests and at least half of them spend their lives high up in the trees, hardly ever touching the ground. Like endless generations of their ancestors they are born, live and perish in this world of green foliage. Among them are the tree-living mammals.

These animals, whether they glide or whether they flap their wings, are all characterized by a double fold of skin that extends from the sides of the body to the limbs and is known as the patagium or wing membrane. This membrane has developed independently several times in different groups of mammals.

Phalangers, small arboreal marsupials of Australia and New Guinea, are related to kangaroos and, like them, carry their young in a pouch. The species are divided into several groups by structural characteristics, and each of these groups includes phalangers both with and without a patagium.

By far the most delightful and attractive of these thick- and woolly-furred creatures are the flying species of which the Short-Headed Phalanger, *Petaurus breviceps*, is illustrated on page 127. This animal attains a length of not more than fifteen inches, eight inches of it tail. It is found throughout New Guinea and similar species exist in Australia. Entirely nocturnal in its habits, it feeds mainly on fruit and insects.

The well-developed patagium extends from wrist to ankle and it is by means of this and its flat, wide, feather-like tail that the animal glides downward from one tree to another; a flight of forty yards across a river starting from a height of thirty feet has been observed. Flying phalangers seldom if ever leave the trees and they sleep during the day concealed among foliage or in the hollow of a trunk. When the young grow too big to be carried about in the pouch they cling to their mother's fur and thus early in life learn to enjoy aerial excursions.

Flying Squirrels belong to an order quite different from the phalangers although they all have a similar broad flying membrane. They are rodents like rabbits, rats and the better-known squirrels which do not fly. In the Flying Squirrels of North

FOUR-FOOTED CREATURES THAT FLY



FLYING SQUIRREL OF THE EASTERN UNITED STATES

America, Eastern Europe and Asia the flying membrane is supported in front by a rod of cartilage which is attached to the wrist, whereas in the African Flying Squirrel it is supported by a rod of cartilage projecting from the elbow. The African Flying Squirrels are not related to those of North America and Asia but belong to an entirely different family.

CURIOUS CREATURES

Flying Squirrels inhabit forests and sleep during the day, either sitting high up in the trees, or hiding in a hollow trunk. They are so strictly nocturnal in their habits that many people do not know of their existence even in regions where they are rather common. Few have seen them and very few have observed their behaviour in their wild state.

The species illustrated is *Glaucomys volans*, of the eastern United States. Head and body are only five inches long, with a tail of about four inches, and they weigh about three and a half ounces. The greyish fur is fine and soft, the eyes are large and the tail is flattened. The underside of the head, the body and the gliding membranes is white.

Striking observations of Flying Squirrels in captivity have been published by Ernest P. Walker, Assistant Director of the National Zoological Park, Washington. He reports that their remarkable form enables them to glide long distances, more than fifty yards having been recorded. 'To take off,' he says, 'they seek an elevated point, then leap into space. Spreading their arms and legs, they take on the form of miniature gliders and steer themselves by raising and lowering their arms to warp their flattened forms. The tail acts as a stabilizer and assists in making the upward swing.'

He also draws attention to the long whiskers which, he says, act as a second pair of eyes. Outstretched in the dark, they brush against unseen obstacles and give warning of danger ahead. He observes, too, that the hands and feet are so remarkably strong that they enable the animals to check themselves, in flying to a tree or branch, by a single finger or toe.

Leaving these enchanting little creatures we turn to another flying mammal. The Caguan or Cobego, *Galeopithecus*, is an animal of uncertain relationship. Having no known living or extinct relatives it is generally placed in an order of its own. The face is pointed, the limbs are slender and the tail is long. A broad, thin membrane of furry skin stretches from neck to



CAGUAN OR COBEGO

CURIOUS CREATURES

thumb and from wrist to ankle. Finger and toes are webbed and the tip of the tail is joined to the outer toes.

This flying membrane is highly developed and much larger than that of the Flying Squirrels. Although it provides no motive power and the Cobego glides, there is control of direction of flight. The Cobego can glide about seventy yards and it is reported that even in the still air of the forests there is little loss of height. Like all flying mammals it is nocturnal in habit and rests during the day, hanging below the branches like a sloth or clinging to the trunk of a tree where it is well concealed by its soft, chestnut-mottled fur. Very active at night, it feeds mainly on leaves and fruit. Cobegos are sometimes called Flying Lemurs or Colugos and are found in many districts, ranging from the Malay Peninsula and Siam to the Philippines, Borneo and Java.

Bats are an old and very distinct order of mammals, the *Chiroptera*, and no other furred animals have wings or can actually fly like the bats. Those mammals which glide, making use of air resistance, have, as we have seen, wide, stretched folds of skin, but none of them provide their own motive power.

The wing of a bat consists of a framework like the ribs of an umbrella formed by the greatly elongated bones of the hand, fingers and arm. This is covered by a thin, rubbery skin which stretches between the front and hind limb. The chest is large, with powerful muscles which move the forearms and thus the wing membrane. The thumbs are free and are provided with claws. The feet are not joined to the wings but have hooked claws by means of which the bats suspend themselves upside down from branches, caves or buildings. This is their natural day-time resting position.

The largest bats belong to a group known as the Fruit Bats, some of which have a wing-spread of five feet. The Fruit Bats of India, Malay and Australia have short ears and fox-like faces and are sometimes called Flying Foxes.



FLYING BAT

CURIOUS CREATURES

The smaller bats generally feed on insects which they catch in flight and in their search for them fly with their mouths open. As a rule they fly more rapidly than the Fruit Bats, fluttering around trees, twisting and turning in pursuit of their prey. In full flight a bat makes about fifteen wing-strokes a second.

Most bats have large ears with an inner earlet or tragus like the species in the illustration, and some have 'nose leaves' on the face, flaps of skin which give the face a grotesque appearance. The function of these appendages, which in many species are of great complexity, is unknown.

All insectivorous bats are nocturnal in habit. They are not blind, contrary to popular belief, although they do not rely on their small eyes. They have developed a very keen sense of hearing which guides them in their flight. By listening to the echoes of their high-pitched cries, which are inaudible to human ears, they weave their way through the complete darkness of caves, and this remarkable method of perception, a kind of radar, takes the place of vision. This has been proved by recent experiments with the common Pipistrelle and the Little Brown Bat of North America, which showed that blindfolded bats still fly unerringly, but those which have ears and mouths covered cannot avoid obstacles.

All bats, except the long-tongued, pollen- and nectar-feeding bats, have well developed teeth, but not all eat fruit, frogs, insects, birds or small mammals. Some species in South America skim the water in order to catch fish and shrimps, while other tropical forms like the Bloodsucking Bats or True Vampire Bats, bite sleeping men or animals with their enlarged sharp-edged incisor teeth and lap up the blood which flows from the small wound.

The leaf-nosed *Vampyrus spectrum*, illustrated on page 136, has erroneously been supposed to be a bloodsucker. This terrifying-looking bat, which attains a length of over six inches and a wing-span of nearly thirty inches, is the largest American Bat of tropical America and the West Indies. It is mainly

FOUR-FOOTED CREATURES THAT FLY



HEAD OF NYCTOPHILUS AUSTRALIS

carnivorous and flies in search of small mammals, birds and reptiles.

Insectivorous bats living in countries where they find themselves without food in winter, hibernate. Donald A. Griffin, whose investigations over a period of fourteen years brought to light many of the habits of the American Bats, writes that he has frequently seen Cave Bats hanging from a rock in compact clusters. Sometimes several hundreds were suspended in a space of less than a square foot. In the five or six months of hibernation they lose about a third of their weight. Metabolism, heart rate, breathing and body temperature fall so low that only the 'expert' can tell a hibernating bat from a dead one.

Bats have been observed to mate in spring and autumn. The theory has been put forward that, after the autumn mating, the sperm remains alive in the uterus of the hibernating female during the whole period of hibernation, resuming activity in the spring when the female awakens. Only then does the actual fertilization of the egg take place. Experiments have shown that this can happen with female bats in captivity.

CURIOUS CREATURES

Most of the bats produce only one young annually which, with fully developed claws, clings to its mother's fur in front of her body and is sometimes carried along as she flies. About one month after birth the young bat has grown almost to adult size and is able to fly, soon to set out with swift and powerful wing-beats, recalling William Blake's lines:

The Bat that flits at close of eve
Has left the Brain that won't believe.



HEAD OF VAMPYRUS SPECTRUM

CHAPTER VIII

GIANTS OF THE ANIMAL WORLD

GIANTS exist in water, on land and in the air. Normally animals characterized by their enormous size are endowed with commensurate strength. The old adage that 'the weakest goes to the wall' is particularly applicable to members of the animal kingdom, and giantism as a way of life is of great advantage to various groups of animals.

There is no disputing the fact that some creatures are much bigger and stronger than others; such difference, however, is relative since each animal has its own rank of power in that sphere peculiar to itself. Some animals, as will be seen later in this chapter, are exceptions in that, despite their huge dimensions, they take no direct advantage of their physical superiority.

Throughout the long history of the Earth the largest giants have been water-living animals, and they still are. Animals that live in water are not in danger of being dragged down by their own weight. Buoyed up by the water in which they live, they are less restricted in the development of their size. This particularly applies to the whales which evolved from land-living ancestors to air-breathing aquatic animals. Like all mammals they are warm-blooded, being protected from cold by a thick layer of blubber below the skin. Though the record of their history is very incomplete it does seem unlikely that they ever before reached the size that some of them do today.

The most spectacular representative of true giantism is the Great Blue Whale which, in antarctic seas, sometimes exceeds a hundred feet in length; some of them have been known to weight as much as one hundred and fifty tons. It is not only the largest living mammal, but is, so far as we know, the largest creature that has ever existed on this planet.

CURIOUS CREATURES

In spite of its amazing size this bulky giant can swallow only herrings and small shrimp-like creatures. Belonging to the sub-order of Baleen Whales, it has no teeth and a throat only a few inches in diameter. In place of teeth the upper jaw has developed rows of horny, fringe-like whalebone which function like a sieve. The whale swims with open mouth through thick masses of small crustaceans living near the surface of the water, and in closing its mouth forces the water through the whalebone strainer with its tongue and swallows the animals which remain. A large baleen whale may eat several barrels of such food a day.

Of all the living 'toothed' whales the Sperm Whale, *Physeter catodon*, is the largest and probably the most widely distributed. Once common in the Atlantic and the Pacific, it is now mainly found off the coasts of Japan, Chile and Natal. This most colourful and pugnacious of all whales, the Moby Dick of Herman Melville's famous book, reaches an imposing size; the males are as much as sixty feet in length but females are much smaller. The head is almost a third of the total length and contains up to ten tons of oil which is known as spermaceti. The upper jaw and muzzle are barrel-shaped; the lower jaw, bearing the twenty to thirty heavy teeth, is slender and pointed.

The Sperm Whale used to be widely hunted for the high quality of its oil which was valued for making clear-burning candles, and although candles are no longer in great demand it is still hunted and killed in large numbers for its oil and for something much more valuable in today's markets. Ambergris, a substance used as a base for good-quality perfumes, is a special product of the Sperm Whale, formed in the digestive tract. It is a greyish substance found only in the intestines of sick whales and is the most valuable of all whale products.

Sperm Whales live eight or nine years and require about a ton of food a day. They prey on colossal octopuses and squids which exist many fathoms below the surface of the sea. When diving the Sperm Whale lifts its tail with the horizontally placed



SPERM WHALE

CURIOUS CREATURES

fins high in the air and goes down almost vertically. It returns to the surface for air after twenty to thirty minutes. Some whales are even able to submerge for periods as long as an hour. Toothed Whales have only one blow-hole or nostril while the Baleens have two. Like many other popular beliefs the one that water enters the mouth when the whale is feeding and is spouted out of the blow-holes on the top of the head is quite wrong. The spouting is produced by air forcibly discharged from the lungs; when the atmosphere is cold enough to condense the warm moisture-laden breath, the spout can be seen rising in the air like a fountain.

The female is a devoted mother. When suckling her young she floats on her side while the calf, thus enabled to breathe on the surface, takes the protruding nipple in the corner of its mouth.

Whales once roamed the oceans of the world in their millions, but they have been hunted relentlessly for more than a thousand years and their numbers severely reduced. They were pursued in small ships and the killing was done with hand harpoons. Men endured constant hardship to satisfy the increasing demand for whalebone, required for feminine fashions, and for oil which was used for many purposes. In 1819 the streets of several English towns were lit by a gas made from whale oil.

Nowadays whales are hunted much more efficiently; the harpoons are shot from guns and the carcasses are processed at sea on huge factory ships, equipped to reduce them to oil and the other useful products. I have myself seen a more primitive example of whale-hunting in Walvis Bay on the south-west coast of Africa. A huge whale, brought in by a tow-boat, was landed on the shore near the local whale factory. With intensive effort the dead whale was moved and the enormous carcass placed on the blazing white sand of this desperately dry desert. It was a saddening sight and only a few sandpipers, hopping about on its back, seemed to find pleasure in this undignified end.



LOWLAND GORILLA

CURIOUS CREATURES

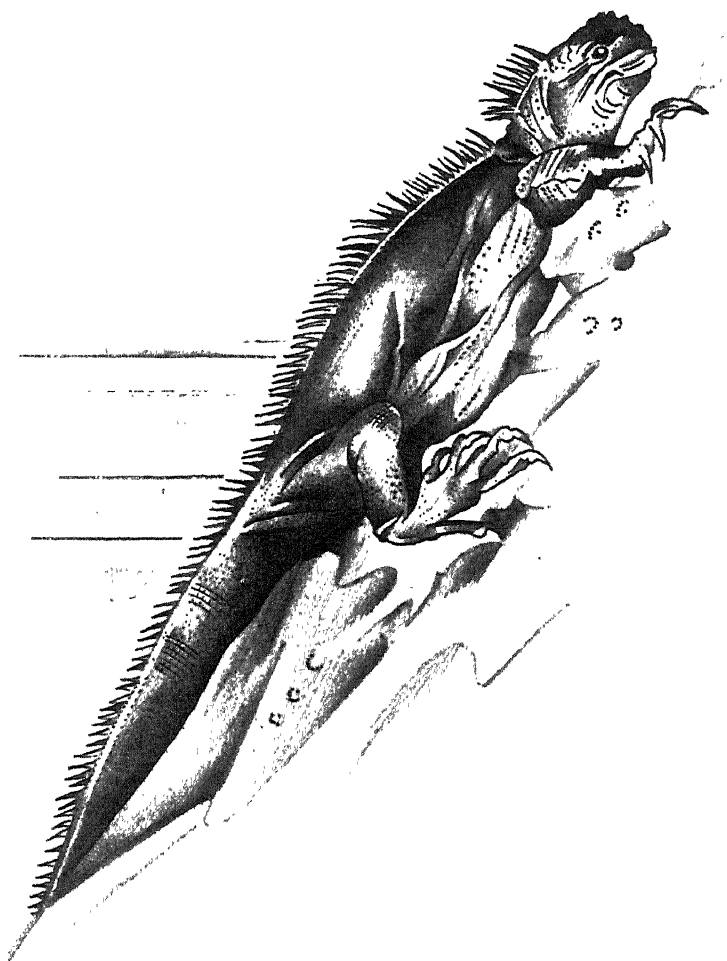
Tree-dwelling giant apes cannot compare in size with the whales, if only because of their mode of life, but nevertheless some of them have gained enormous strength. The Gorilla is the largest, strongest and most formidable of the anthropoid apes. The males weigh more than three hundred pounds, some in captivity even as much as six hundred pounds. This animal has become a veritable Hercules — not in height, for it is only about six feet, but in muscular development and power of limb. The Gorilla, who mainly keeps to the ground, seldom walks erect, though he is able to do so better than the other apes, but when expressing rage or when challenging a foe he suddenly stands up straight, beating his breast violently, a ferocious giant indeed in his own sphere.

The Gorilla, for all that, is no predator and in spite of the strength of his jaws, with the enormous teeth, he prefers vegetable food, although he may occasionally pick up a bird or an egg.

The great apes share man's habit of sleeping in a reclining position. These nomads have to provide themselves each night with platforms or beds. It is the old Gorilla that makes a shake-down of branches at the foot of a tree while the females and the young spend the night on platforms in neighbouring trees. In this way the adult Gorilla, too powerful to be attacked, keeps away the leopards which might otherwise prey on the young.

In recent years many studies have been made of Gorillas in their natural haunts, mainly in the forest reserve of the Kivu district of the Belgian Congo. One student of the Gorillas, R. L. Garner, the 'ape-language man', lived for a hundred and twelve days in a cage which he constructed in the African jungle, where he made many observations and learned to repeat many ape calls. The Gorilla gives voice to a grunt, but when he is excited this becomes a terrific roar.

Another naturalist who spent many years in intensive study of the wild Gorilla was Carl Akeley. It was through his enthusiastic efforts that the Albert National Park, in the Belgian



GREAT MARINE IGUANA OF THE GALAPAGOS ISLANDS

CURIOUS CREATURES

Congo, was established, and in this tropical belt the gigantic Gorillas have a sanctuary, unharmed by the growing industrial advance of civilized man.

In the Galapagos Islands, where the world seems to have remained in its youthful state, the predominant animal forms are still reptilian and include the Great Marine Iguana, *Amblyrhynchus cristatus*, one of the most unusual of all living lizards. This animal has the distinction of being, so far as is known, the only lizard in the world today which has taken to living in the sea. There it spends most of its life and there it finds the seaweed on which it feeds exclusively.

This unusual vegetarian attains a length of nearly five feet and is the largest of all American lizards. It was first described by Darwin in his book *A Naturalist's Voyage Round the World* and more recently by William Beebe in *Galapagos: World's End*.

While these lizards feed in the sea, they seek shelter and lay their eggs ashore, and, once ashore, they cannot be induced to re-enter the water except of their own volition. Even when one was thrown into the sea it returned at once to the rock from which it had been thrown, and it did this repeatedly. Darwin's suggested explanation of this curious habit was that the Marine Iguana has no enemies on shore, man having come too recently to have had any influence on its racial behaviour, but at sea they often fall prey to the numerous vicious sharks.

The great reptiles always swarm in groups some hundreds strong, covering the hot lava rocks with their brown or blackish forms. A crest of spines runs the whole length of the body from nape to tail and this, combined with the tuberculated skin and the habit of blowing spray from its nostrils, gives the reptile a most formidable appearance. Dr. Beebe assures us, however, that although 'these splendid saurians are creeping about like great prehistoric monsters' they are the most gentle and docile dragons and cannot be induced to bite either by sudden fright or by constant teasing.



BLACK-TAILED PYTHON OF CELEBES AND JAVA

CURIOUS CREATURES

Marine Iguanas are still abundant, but the vast hordes which might have been seen some twenty-five years ago no longer exist. They are slowly but surely decreasing in number and are already extinct on three of the islands. They were hunted vigorously by the inhabitants, who used them for food, but they are now under protection. When Darwin first went to the Galapagos Islands, at the age of twenty-six, Marine Iguanas were so prolific that he fell over them wherever he walked.

Another giant reptile, of a less gentle and less docile behaviour, is the Python, one of the world's largest serpents. The Black-Tailed Python of Celebes and Java is over twenty feet in length, but the Reticulated Pythons of Burma and Malaya sometimes exceed thirty feet and in the larger specimens the spinal column may number over four hundred vertebrae, which is more than any other animal possesses.

Pythons belong entirely to the non-venomous species of snakes. These large animals kill their prey by constriction or strangulation. Throwing successive coils of their bodies around their prey they crush them to death by muscular contraction. The unfortunate victim is then swallowed whole, head first.

The extent to which the jaws and the body generally can be expanded for the passage and accommodation of food is indeed formidable. The larger Pythons by no means content themselves with such small prey as birds, hares and rabbits. Their more usual menu includes goats, sheep, pigs and some of the smaller deer. After a solid meal the Python remains sluggish and in a state of semi-torpor for several days, not returning to active life until the digestion of the food has been accomplished — which, in the circumstances, is understandable. As is well known, these and other snakes can exist for periods of many months without a meal.

In their location of food Pythons are assisted by small pits near the nostrils which act as heat receptors and which are used for seeking out warm-blooded prey and striking at it with precision in the dark. These snakes are excellent swimmers



AFRICAN GOLIATH BEETLE

CURIOUS CREATURES

and tree-climbers, undertaking both activities in their search for food.

Reticulated Pythons sometimes lay as many as a hundred eggs at one time and of these about eighty hatch out into new monsters at the same time. The eggs laid by the female are oval and soft-shelled. She piles them into a heap and curls herself around them, her length and girth reaching such remarkable dimensions that she can gather her entire progeny within her coils, and the young emerge from their shells after fifty-five to sixty days. It is said that during this period of incubation the body temperature of the female rises by several degrees, but this has yet to be confirmed.

It is estimated that about nine-tenths of all the creatures living on the face of the Earth are insects. Of beetles alone no fewer than a quarter of a million species are known.

One of the largest of the beetle-tribe is the famous West African Goliath Beetle, *Goliathus regius*. It is an imposing, gaily-coloured creature between four and five inches in length, and broad and bulky in proportion. The curious, slightly convex, flat head is a greyish white and is embellished with two black, oddly-shaped horns. The legs are of a reddish tinge and the hind pairs are fringed with silky golden hairs.

In spite of their gigantic size and the powerful claws with which the feet are armed, these ponderous beetles are harmless and inoffensive creatures. Their haunts are dense forests where they fly around lofty tree-tops, making a noise not unlike a small aeroplane. They are particularly fond of the juicy sap of various tropical plants.

The first stage in the life of these beetles is passed hidden in the soil as huge fleshy grubs. When fully fed they construct large earthen cocoons in which they undergo their transformation. The cocoons are oval in shape, each about as big as a swan's egg.

The existence of the Goliath Beetles was unknown until the end of the eighteenth century when a naturalist found the



HERCULES BEETLE

CURIOUS CREATURES

dead body of a fine specimen floating down the Gaboon River.

The size of the Goliath Beetle is closely rivalled by several others of his tribe which, in addition to their large dimensions, possess the most extraordinary hornlike projections, the use of which is the subject of many speculations especially as most of these mammoth beetles are in no way pugnacious.

One of the finest of these giant beetles is the Hercules Beetle, *Dynastes hercules*, of tropical South America. It is believed that the males sometimes use their horns for the purpose of carrying their females about.

The male Hercules Beetle measures over six inches, of which length the enormous horn into which the thorax is prolonged accounts for four inches. This horn curves slightly downward while a second one, rising from the head, curves upward to meet it giving the general, though erroneous, effect of a huge pair of jaws.

While the female is not at all attractive, the male is a most spectacular creature. His wing-cases are of a deep olive green, the head and thorax are ebony black, and the longer upper horn is fringed with a short dense brush of golden hairs. The Hercules Beetle hides during the day, coming out at night to feed and to fly around in search of a mate.

Titans exist not only among beetles but also among moths. They are usually found in the warmer parts of the globe where the heat of the sun and copious rain ensures an abundance of food. The huge caterpillar of the American moth *Cytheronia regalis* is shown in the illustration. It reaches a size of about six inches in length. This strange-looking creature is shown in the hanging position, head downwards, which it adopts just before beginning to change into a chrysalis. It looks most alarming, viewed at close quarters. The strange plume-like appendages on the head are apparently calculated to terrify and to repel even the hungriest of enemies.

Many caterpillars make their first meal from the remains of



GIANT CATERPILLAR OF
CYTHERONIA REGALIS

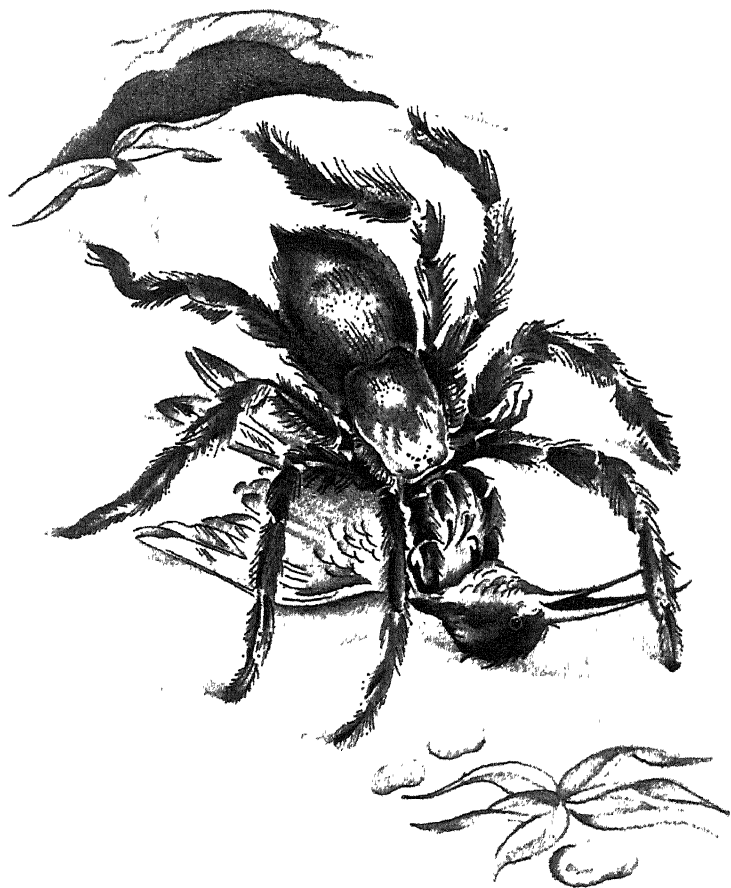
CURIOUS CREATURES

the egg from which they have hatched. They often find themselves already deposited on the plant or tree most suited to them from the point of view of food, and they can therefore settle down at once to eating. They grow quickly and this necessitates a series of new skins; the caterpillar stands revealed in its new skin every time the old one splits. Finally, a kind of varnish is exuded which hardens into the outer shell of the chrysalis. At the end of the pupa stage the skin splits and the perfect moth, *Cytheronia regalis*, emerges, with a wing-span of over seven inches.

There are several species of these giant moths. For instance the Owl Moth, from Brazil, and the Hercules or Atlas Moth, from New Guinea, sometimes measure more than twelve inches across the extended wings. Nature has provided these mammoths with the largest possible wing-span so that they can carry their heavy load of two hundred or more eggs high above the jungle in search for trees with foliage that will later feed and sustain the elaborately-coloured caterpillars until they reach a thickness of one inch and a length of not less than seven.

The role of giant is also filled by the Bird-eating Spider, *Psalmopaeus cambridgei*, which lives in the tropical parts of South America. A master of fasting and solitude this hairy, dark brown spider often comes to Europe as a stowaway in bunches of bananas, and one of them lived for over five years in the Insect House of the London Zoo undergoing a series of moults, sometimes two or three in a year.

Bird-eating Spiders are as large as a man's hand and the segments of their bodies as big as walnuts. They are reputed to be able to jump several feet and to pounce upon their prey either on the ground or in trees. With their poisonous bite they kill small birds in a minute or two. In addition, the hairs which cover their bodies can cause very painful inflammations and swellings if they penetrate the skin. A curator, mounting a dead specimen, accidentally rubbed his finger against the



BIRD-EATING SPIDER

CURIOUS CREATURES

creature's body and received such a heavy dose of hairlike spicules that it was over a year before he regained the full use of his hand.

The largest coralline formation in the world, the Great Barrier Reef off the coast of Australia, was not discovered until 1770 when Captain Cook was almost wrecked there. This reef stretches for about 1250 miles along the north-east coast of the continent, enjoying a great variety of climatic conditions and harbouring within its boundaries innumerable different forms of animal life.

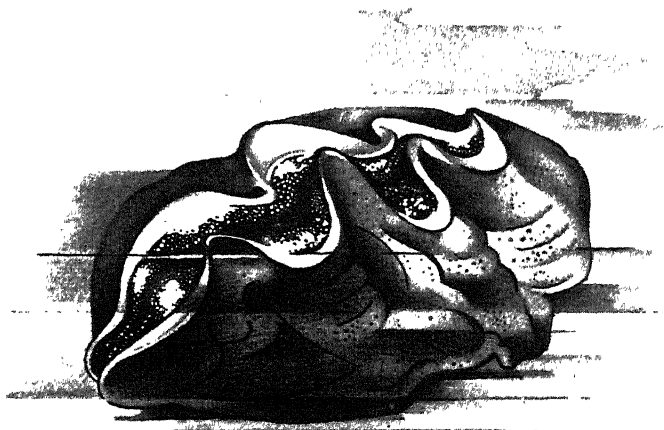
One of the most striking inhabitants of the coral labyrinth is the Giant Clam, *Tridacna gigas*, which may attain a length of four and a half feet and a weight of nearly five hundred pounds. Permanently fixed to one spot by virtue of its weight it devotes all of its energy to building up the colossal shell. It feeds itself by filtering sea water through a form of a siphon and gets additional nutrition from microscopic plants which live in the region of its tissues and which generally protrude from the shell and are thus exposed to the full force of the tropical sun. Using the radiant energy of the sunlight, these plants, like other plants, build up starch and sugars.

A bivalve mollusc of this amazing size has always, quite naturally, excited interest. Sailors of the time of the Renaissance who had already encountered these giants brought them to Europe. One particular pair, once presented to Francis I of France, later found their way to the Church of St. Sulpice in Paris where they are still in use as holy-water basins.

This enormous shellfish, by contracting certain powerful muscles, can display the most amazing strength; at the slightest touch the two serrated valves of the shell shut tight and are held so with fantastic tenacity. Men wading or diving in search of pearls have lost their lives through accidentally placing a foot between the open valves. Once within the grasp of the clam there is no escape unless a companion should happen to come with a crowbar or some such thing to prise the shell open.

GIANTS OF THE ANIMAL WORLD

Sheltered among corals, and safeguarded by the sea, the Giant Clam is widely distributed throughout the northern half of the Great Barrier Reef. This largest and strongest shellfish enjoys immunity from attack from various enemies and is a most imposing example of giantism.



GIANT CLAM OF THE GREAT AUSTRALIAN
BARRIER REEF

LIVING UPSIDE DOWN

THERE is a great diversity in the conditions to which animals have to adapt themselves and equally diverse are the responses to these conditions, some of them most queer and curious. For instance, various creatures spend the whole of their lives in a state of suspension, upside down, and some have become almost specialists in this topsy-turvy life.

The largest of the considerable number of animals existing in this reversed state is the Sloth, of which the three-toed *Bradypus tridactylus* is shown in the illustration.

The Sloth is the sole survivor of a once mighty race. Until comparatively recent times the plains of South America knew many species of gigantic ground sloths, some larger than oxen. Fossil bones of these creatures have been found in the caves of Patagonia together with human remains of the same age. There is, in fact, evidence that these large, hairy and muscular creatures were kept in captivity by early men. Today only the small arboreal forms exist, and they owe their survival to concealment in the dense, fever-haunted jungle of the Amazon forests.

Anatomically the Sloth is well adapted to life in the trees. Its long limbs, terminating, according to the species, in two or three hooked claws, are so arranged that they cannot support the animal's heavy body on a level surface. When it is forced to the ground the Sloth struggles along with painful swimming movements. In the tree-tops, however, the Sloth is really in its element and moves at a fair pace, walking literally upside down. Clinging effortlessly to the boughs with its long claws, it feeds exclusively on leaves within its reach.

The dense, matted hair of the Sloth grows towards the head



THREE-TOED SLOTH

CURIOUS CREATURES

so that, as the creature hangs head down from the trees, the rain shoots off and leaves the animal dry. In one species each hair is grooved and green algae forms within the grooves; the general effect is to transform this Sloth into a green creature blending perfectly with the surrounding mass of rotting vegetation. This, however, only happens in its native habitation.

Often the branches of the trees in the primeval forests overhang rivers, a circumstance which encourages the Sloth to take to water, and it can swim a mile in just over half an hour. It can walk upside down in the tree-tops at an average rate of five yards a minute.

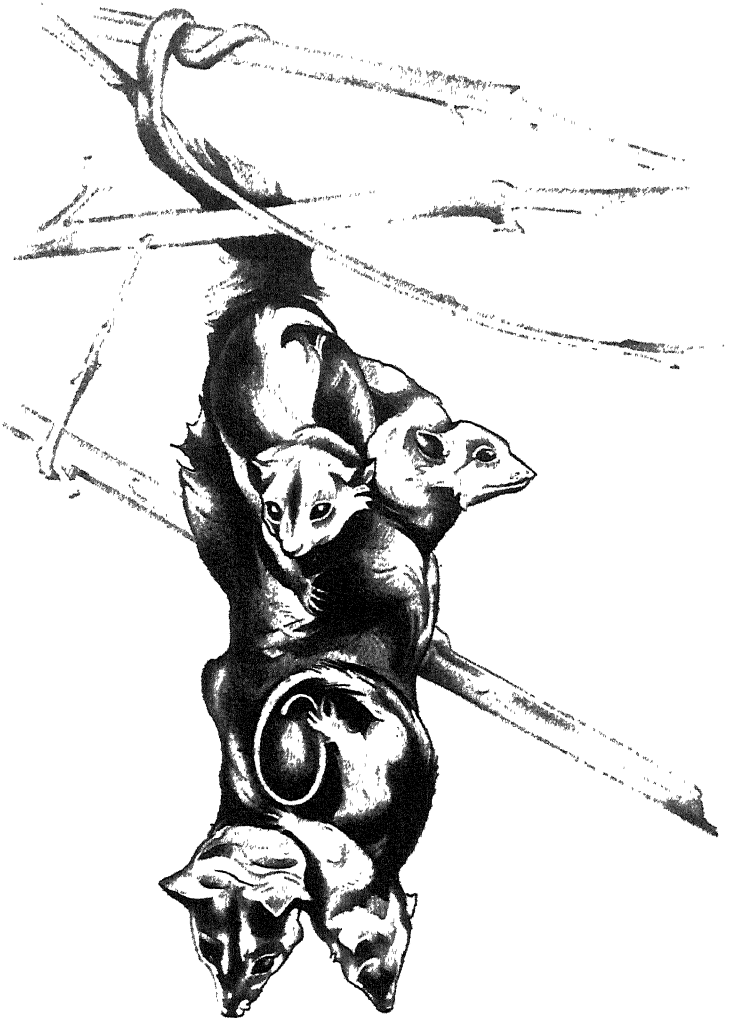
Sloths have many enemies and, apart from their power of concealment, they possess no means of defence. Natives shoot them from below; jaguars and snakes pursue them in the trees; the caribe fish eat them alive if they are caught swimming in midstream; great birds of prey keenly watch their movements from the air.

There is but one young Sloth born at a time, which is nursed and carried about by the mother, clinging to her hair with its long claws and clasping her firmly around the neck with its long arms. Silent like its parents the young Sloth, only on rare occasions, has been heard to utter a feeble and plaintive 'mew'.

From birth to death the Sloth never makes a sudden or jerky movement, and although each one may have its own individual cast of countenance this never undergoes the slightest change of expression. Everything connected with this animal appears to be slowed down to the utmost; pulse, muscular reaction and mental processes alike move along evenly in bottom gear.

Even the internal economy is equally languid. It is so completely retarded that, according to observations made by the late Dr. Honigsmann in the London Zoo, a meal required up to six weeks for assimilation, a process completed by most mammals in as many hours.

In contrast to the Sloth the arboreal Woolly Opossum of America is equally at home on the ground or high up in the



FEMALE WOOLLY OPOSSUM AND HER YOUNG

CURIOUS CREATURES

branches of the trees. For life in the trees use is made of the prehensile tail as a fifth hand, and with this appendage the whole family 'strap-hang', the mother carrying her young on the back as shown in the illustration. Sharp claws assist the young to keep a safe hold.

Opossums are the only marsupials or pouched animals in the Western hemisphere; they range in size from that of a mouse to that of a cat. The pouch is somewhat less developed than in the Australian marsupials, and the young leave it at an earlier stage. There are several young and in the case of the Common Opossum, typical of the family, sometimes more than a dozen are born in one litter, each making its way directly after birth to the pouch where it fastens on to one of the nipples. There they remain for between sixty and seventy days. Since the number of nipples in the pouch does not exceed thirteen, those young in the litter over and above that number cannot survive.

The Opossum is an adept at feigning death, and it is easy to see whence comes the expression 'to play possum' as a synonym for keeping quiet or simulating death. When captured or frightened, the Opossum immediately pretends to be dead, lying motionless on the ground with its tongue hanging out of its mouth and its eyes closed. This is a very successful stratagem for those animals which feed on living prey will not touch carrion.

Opossums are nocturnal in habit, sleeping during the day in a hole in a tree trunk. They are omnivorous and versatile animals, eating almost anything from birds to fruit, from frogs to insects, and they frequently kill poisonous moccasin snakes.

Unlike the American Opossums, African Bush Babies or Galagos are strictly tree-living animals. Bush Babies are lemurs and, being primates, belong to the same natural order as apes and monkeys. These beautiful little creatures vary in size from that of a small squirrel to that of a large cat.

They have large, naked, sensitive ears which can be folded at will. The tips of the fingers and toes are enlarged into flattened

LIVING UPSIDE DOWN



LESSER BUSH BABY

discs which give the little creature an extra foothold after a long jump.

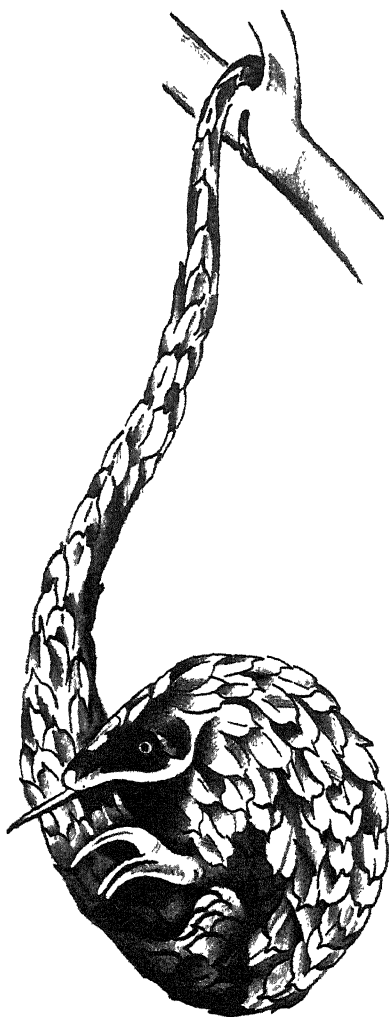
Curled up in a ball high up in a tree, the Bush Baby sleeps most of the day, but at night it becomes very active, feeding on all kinds of fruit, insects and birds' eggs.

By far the most fascinating features of the Galagos are their huge nocturnal eyes which are immense in comparison with the size of the head. Almost equally fascinating is their extraordinary ability to turn their heads 180 degrees in either direction. The species illustrated is the Lesser Bush Baby, one of the smallest of the order.

West African Tree Pangolins have the distinction of being the only African mammals with prehensile tails. These strange anteaters look very much like some odd reptilian survivals, their bodies being covered with stiff, overlapping scales. Except for the underside, the inner surface of the limbs and the sides of the face, the whole animal is protected by this horny armour.

When alarmed the Pangolin rolls itself into a tight ball, with its snout thrust between the forelegs. The bending of the body erects the scales so that they are presented edge on to the intruder. In this position the Pangolin can resist the onslaught of almost any kind of enemy and can even drop to the ground from a considerable height without injury.

CURIOUS CREATURES



TRI-CUSPED PANGOLIN OF
WEST AFRICA

Many details about these animals have been revealed by Mr. G. S. Cansdale who observed them very closely in West Africa. They are, he says, almost impossible to keep in captivity as the old ones obstinately refuse to be fed, even on their native food; even so, some years ago one was kept alive and well at the London Zoo for over a year on a synthetic diet which simulated the Pangolin's natural food.

Pangolins take all their food and drink by means of their long, sticky tongues. As the strong curved claws of the forefeet open the nest of tree-ants or termites, this tongue is able to explore every corner and extracts the ants' larvae and eggs.

The Tri-cuspe Pandgolin, *Phataginus tricuspis*, is shown in the illustration hanging by its tail, head downwards. The muscles in the tail are so strong that the creature can lift itself with ease from this hanging position on to the top of the branch.

Birds usually dislike being upside down, although some will roll over readily enough

LIVING UPSIDE DOWN

in display or in fighting, and many adopt the reversed position when feeding. The Nuthatch, however, differs from all other tree-climbing birds in its readiness to descend head downwards. This habit is partly due to the fact that the quills of the short tail are not stiff enough to afford support in climbing and the bird is therefore dependent entirely upon its strong feet to obtain a strong hold on vertical surfaces.

Nuthatches feed on insects, spiders, insects' eggs and other similar food. They are also partial to starchy seeds and nuts which they wedge into some suitable crevice in a branch of a tree and split open with blows from the long straight bill to get at the kernel. This latter practice is what has earned them their name, Nuthatch.

About sixty different kinds of Nuthatches are known and they are widely distributed. Most of them nest in holes in trees and some species use mud to close the cavity leaving only a small hole open for use as entrance and exit. The Red-Breasted Nuthatch, *Sitta canadensis*, which is shown in the illustration, has a high-pitched nasal call rather like the sound of a toy trumpet. In migration it reaches the Gulf coast and Northern Florida.

Reptiles as a class have an even stronger aversion than birds to the upside down



RED-BREASTED NUTHATCH

CURIOUS CREATURES

position. Geckos, however, frequently travel and repose with their heads downwards. They are flat-bodied lizards with adhesive pads on the undersides of their expanded toes which enable them to run and to hunt upside down on walls and ceilings without falling.

The Gecko group numbers about three hundred species, the majority of which are to be found in tropical countries. In common with other lizards they are noted for the facility with which their tails become detached and are left in the hands of would-be captors. In course of time a new tail grows from the stump and within a few months is the same size as the one lost, although usually somewhat deformed.

Geckos are, for the most part, nocturnal in habit, when they hunt for all kinds of insects, their eyes being especially adapted for this purpose. They possess no eyelids and in daylight the pupils of the eyes are elliptical like those of cats. As night approaches the transparent glass-like membrane which covers the eye is retracted, displaying a pupil of abnormal size and luminosity.

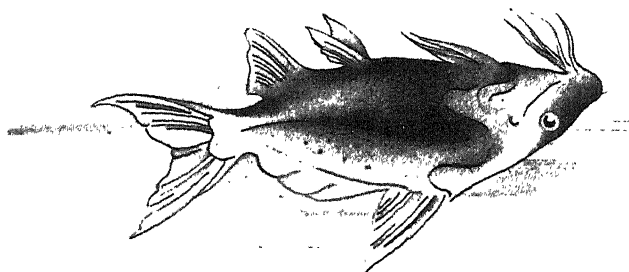
It is also worthy of note that Geckos are one of the few members of the lizard family which possess the power of emitting distinct vocal sounds. The name Gecko is, in point of fact, derived from the little clicking mating call which many species give. Though their voices are not individually very loud, a number of these creatures can produce quite a lively nocturnal concert, and they are to be heard in many Mediterranean countries.

It is well known that a fish found floating upside down is either dead or very sick. There are, nevertheless, a few exceptional instances of fish favouring this position. One which has the eccentric habit of swimming belly upward is the African Catfish, *Synodontis batensoda*. This inhabitant of the Nile has frequently been depicted by the ancient Egyptians, who missed very little in the way of natural curiosities, in this abnormal position on their reliefs and wallpaintings.



GECKO

CURIOUS CREATURES



AFRICAN CATFISH

The whiskered *Synodont* also has the usual fish pigmentation reversed. The underside is darkened and the back is silvery; this is undoubtedly an adaptation due to its habit of living upside down, for a silvery surface exposed to light would make it much too conspicuous and an easy prey for its winged enemies.

What appears to be the best method of defence devised by any fish is that of the Porcupine Fish, *Diodon maculatus*. This denizen of tropical seas lives in the same waters as sharks and other aquatic marauders. Only two feet or less in length, a slow swimmer, the Porcupine or Burr Fish has perforce had to evolve an effective protection.

The body, which is densely covered with sharp, stout spines, can be inflated with either water or air until it is almost spherical in shape. This formidable balloon with its armour of sharp erect spines turns over in the water and floats back downwards. In this state the fish is almost impossible to grasp and constitutes a most disagreeable and painful meal even for a shark. When it wants to revert to its normal state the Porcupine Fish expels the air from the gullet through mouth and gills, the expulsion causing a curious hissing sound, and then resumes its normal position, swimming back upwards.,

In contrast to the fish world, when we come to the insects we have no difficulty in finding many which live upside down. Numerous kinds are to be found sheltered underneath leaves,

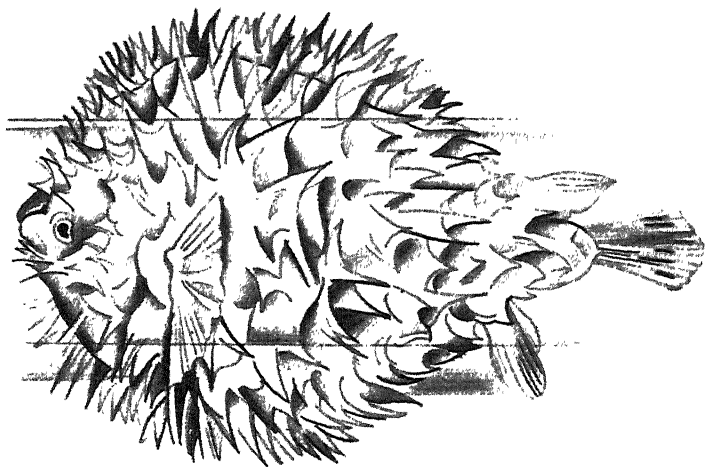
LIVING UPSIDE DOWN

hanging upside down. Others, like the flies, walk with the greatest ease over smooth surfaces such as the ceiling, and even butterflies, which pass the greater part of their lives in the normal position, start life as caterpillars living upside down.

The glossy black Carpenter Ant is quite at ease hanging back downwards. These ants make their home in solid timber into which they carve long galleries. They are very careful not to reveal the presence of the nest, removing all sawdust and fragments of wood from the entrance to their communal home.

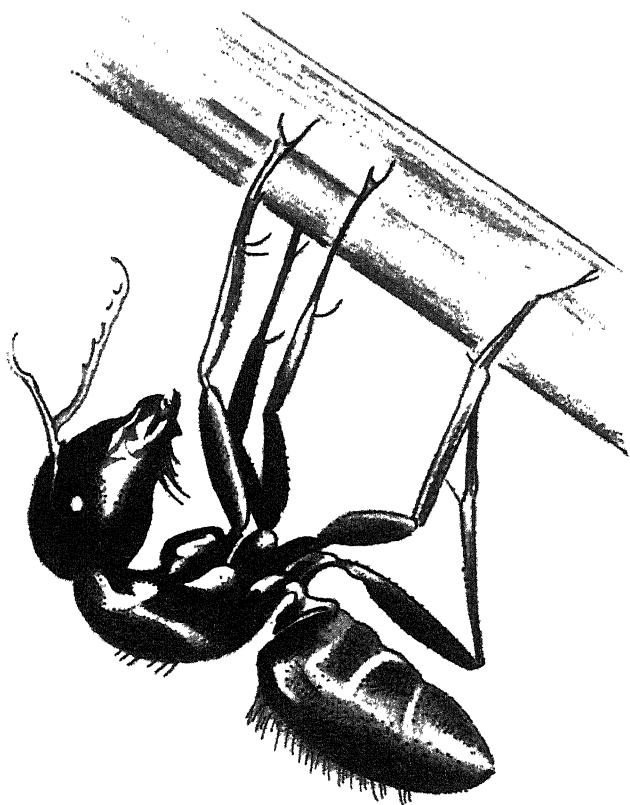
All the 6000 species of ants from various parts of the world are social in habit and their colonies endure from year to year. They are given first place among social insects and they are indeed the highest developed and most successful exponents of this way of living.

Some striking examples of an upside-down existence can also be observed among crustaceans. These are invertebrate animals with jointed limbs and segmented bodies covered with a hard substance known as chitin. This stiff armour is



INFLATED PORCUPINE FISH FLOATING BELLY UPWARDS

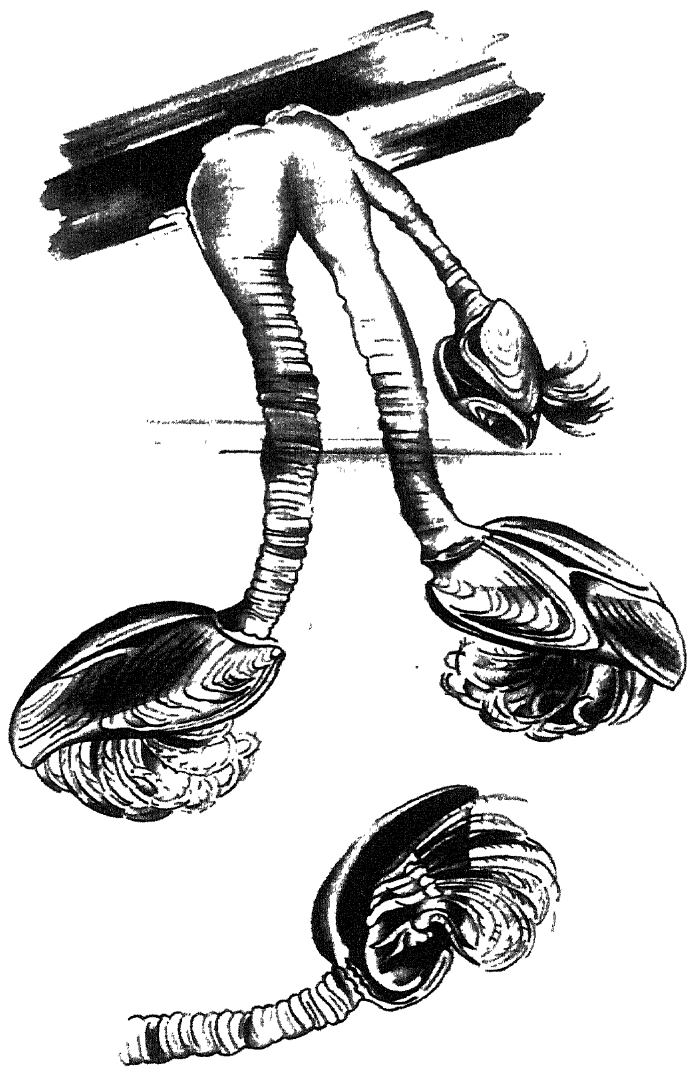
CURIOUS CREATURES



CARPENTER ANT

jointed so that the animals can move freely. There are, however, some crustaceans which, at least in the adult stage of their existence, have given up the normal use of their limbs.

The most peculiar example of this class is the Goose Barnacle, *Lepas antifer*, which not only stands on its head but more or less cements itself in that position. As late as the seventeenth century people believed that geese were bred from these organisms. In 1597 John Gerard, herbalist and writer, published his famous *Herball or History of Plantes* which contained a long



GOOSE BARNACLES
Below: SECTION OF A SHELL

CURIOUS CREATURES

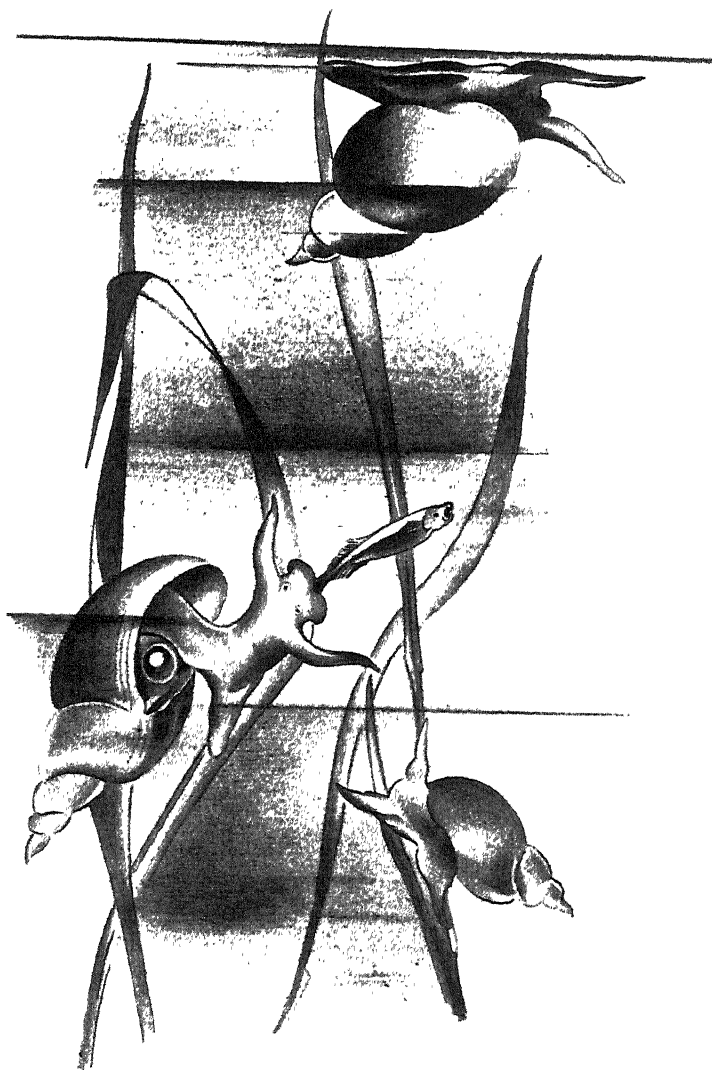
passage dealing with Barnacle Geese. He claimed that they were to be found on a small island in Lancashire called the Pile of Foulders, that they were known by local inhabitants as tree-geese and that they were so plentiful that one of the best could be bought for threepence. He went so far as to illustrate his conviction with a drawing of geese hatching from a tree with growing Barnacles, whence they flew straight down to the sea.

This fantastic association of the Barnacles with geese having proved erroneous, it was later assumed that they were molluscs until it was found that in the larval stage they were free-swimming creatures very much like the young of any other crustaceans. It is only after having changed their skins and their appearance several times that they glue themselves in a fixed reversed position to rocks and ships.

Thus hanging upside down, Barnacles gradually take their final adult form. The head elongates to a flexible stalk, sometimes more than a foot in length, and the body is protected by a shell of five plates from which the fringed legs protrude. No longer used by the animal for moving itself about, these feathery limbs and feet remain in action vigorously drawing in food in the form of minute organisms. The lower drawing in the illustration shows a cross section of a shell.

The Pond Snail is another invertebrate which has adapted itself for life in a reversed position. Pond Snails are freshwater forms found in most parts of the world. They are gastropods — from the Greek *gaster*, stomach, *pous*, foot — a name derived from their moving about by means of a flat muscular sole on the underside of the body so that they seemed to walk on their stomachs.

Gastropods have long, ribbon-like 'tongues' studded with minute teeth with which they tear up their food and draw it into their mouths. The Great Pond Snail, *Limnaea stagnalis*, the largest of the family, living among water weeds, has over twelve thousand such teeth. It feeds on all kinds of water



GREAT POND SNAIL

CURIOUS CREATURES

plants but enjoys an occasional meal of a small fish. The shell is thin, horny and sharply pointed; the head has two tentacles and the eyes are seated at the base.

Like other aquatic pulmonates the Great Pond Snails breathe air by means of a lung formed from the mantle cavity and have to come to the surface at intervals. They may often be seen in an inverted position immediately below the surface of the water, yet another example of eccentricity in nature's strange and endless cavalcade.

ANIMAL CAMOUFLAGE

THE word camouflage has many meanings. It covers disguise, imitation, mimicry, effacement and 'the art of make-believe'. Practised by animals of very different types for the purpose of defence or aggression, it takes various forms. But whatever the method of camouflage may be, each animal is, in most cases, helped to accomplish the task by its colour and form. The colour vision of animals, as far as can be learned, shows all kind of variations, playing their part in the struggle as well.

The most significant style of animal colouring is protective. Creatures that are protectively coloured or patterned harmonize with their surroundings and are invisible, provided they adjust themselves to those surroundings, either by remaining motionless or by some other suitable behaviour.

The illustration of the Greater Kudu, *Strepsiceros strepsiceros*, shows a bull endeavouring to escape notice by assimilation into its surroundings, so placing its head that the spectacular horns rest along its back.

Of all the African antelopes there is none of so fine an appearance as a great Kudu bull in its wild state. Standing as much as four-and-a-half feet from ground to shoulders, it is of a light brown colour with five or six white stripes down the sides. The large horns, in a corkscrew spiral, may measure up to fifty-one inches and are the longest known in the animal kingdom.

This beautiful beast is, despite its imposing appearance, a gentle creature which rarely attempts to defend itself when attacked by lions, leopards or wild dogs. It relies entirely for its safety on its sight, speed and ability to hide.

Kudus hide themselves very well among bushes, grass and

CURIOUS CREATURES



GREATER KUDU BULL ENDEAVOURING TO ESCAPE NOTICE
BY ASSIMILATION INTO ITS SURROUNDINGS

trees. The shadows of the twigs, thorns and leaves blend so well with the striped brown body that it is hardly possible to detect a Kudu until it moves. In fact, a whole herd of Kudus can hide surprisingly well in this way, even in thinly wooded parts of the country. They stand perfectly still unless they are

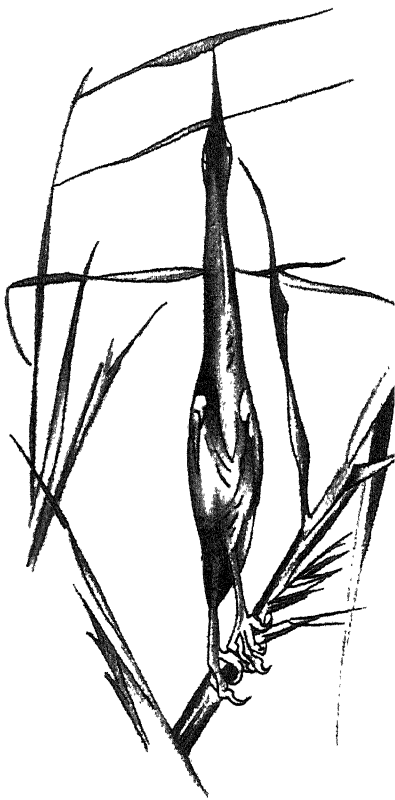
ANIMAL CAMOUFLAGE

frightened. Only then will they run off at a great and easy pace, the bull with the huge horns laid back close over its slightly humped back, the females having no horns.

The game of living can be a very serious one of hide and seek so far as animals are concerned, and there is no quality more generally useful to an animal than that of being inconspicuous.

In some birds the concealing coloration is associated with a special posture of the body when fear induces a desire to escape detection. The Bittern, *Botaurus stellaris*, takes up a rigid pose with its beak pointing skywards, at the same time facing its enemy and presenting a series of dark vertical lines on a paler background which harmonize perfectly with the shafts of light seen between the long reed stems. The feathers of the neck and body are compressed and the bird remains perfectly still.

In stormy weather, however, the Bittern changes its attitude and moves its body rhythmically with the swaying reeds, preventing itself from becoming an isolated target. In so doing the little bird demonstrates very well how necessary it is that protective colouring should be supported by suitable behaviour.



BITTERN IN RIGID POSE

CURIOUS CREATURES

'Nature', writes an Australian naturalist, 'has provided the Pordagus with a plumage that enables the quaint bird to simulate the surroundings so as to escape observation by any but the practised eye.' This bird is one of the most bizarre of Australia's fauna. It is sometimes called Frogmouth but is more popularly known as the Morepork because of its repeated cry for 'more pork'.

The Morepork is a perfect example of a night bird. This representative of the night-jar family needs no camouflage when hunting in the dark. It sails along through the warm, insect-laden air with a huge gaping beak, showing the yellow interior, and with bright, open eyes. During the day-time, however, it is perched motionless in an upright position in a tree where the mottled, barklike feathered form is often mistaken for a broken branch. With its eyes closed it sleeps safe and sound, accentuating the effect of colour harmony by absolute stillness.

Protective or concealing coloration is apparent everywhere, even in pond, lake and sea, where many fish have peculiar skin embellishments which perfectly simulate and blend with the vegetable growth amongst which they have their existence.

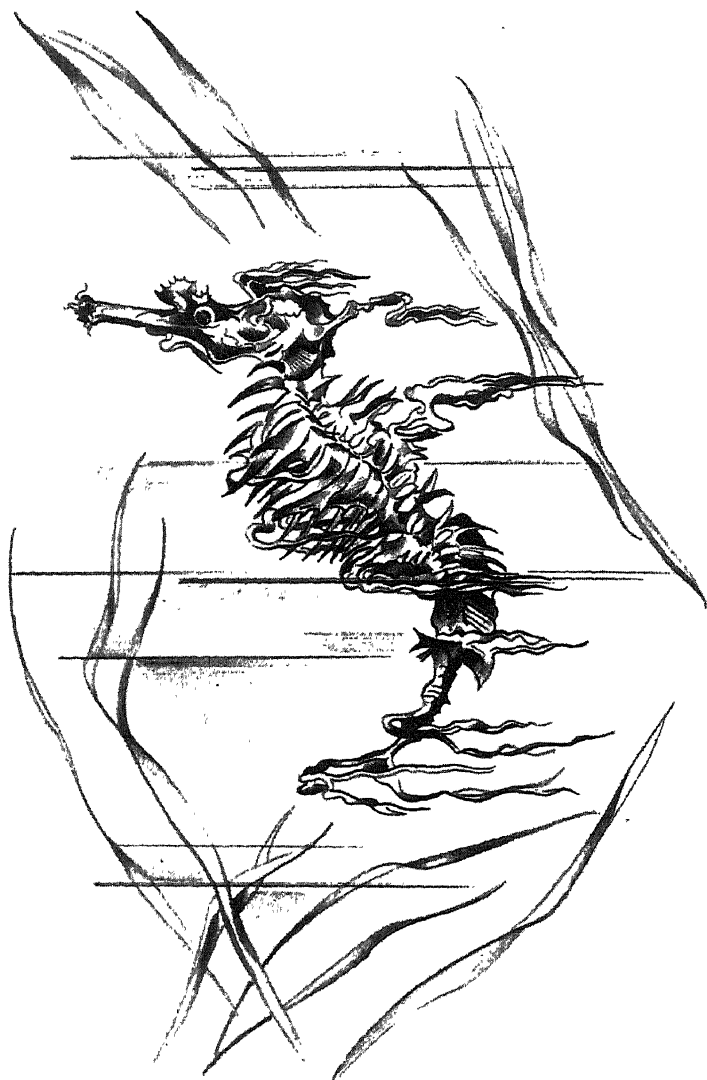
In the vast underwater world of the Great Australian Barrier Reef lives a tropical Sea Horse known as the Sea Dragon, *Phyllopteryx eques*. These small fishes are described by William Beebe as being 'to ordinary sea-horses as orchids are to violets or birds of paradise to house sparrows'.

Brightly coloured, in orange, lavender and vermilion, they are indeed the most remarkable of all Sea Horses. The angular, many-pointed armour is decorated with scores of waving tassels, plumes and feathery appendages. These, streaming in the water, so resemble, by their shape and their colour, the fronds of the seaweeds in which the creature hides that detection is almost impossible.

Another fish adapted for a quite inoffensive life among weeds is the Angel Fish, *Pterophyllum cimekei*, of the Amazon and its



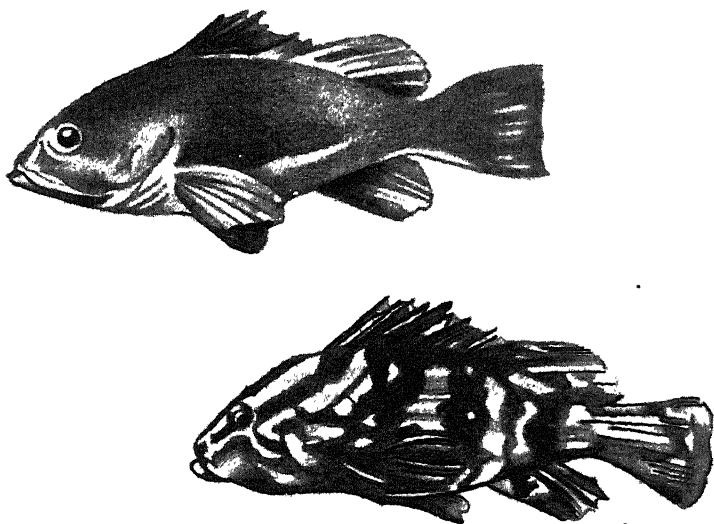
MOREPORK OR FROGMOUTH OF AUSTRALIA



SEA DRAGON

ANIMAL CAMOUFLAGE

tributaries. Exquisitely 'designed' in black and silver, with bright orange eyes, these beautiful fishes drive gently through the water. The flat bodies, compressed to an extreme degree of thinness, are striped, and the fragile, sail-like fins often reflect a violet sheen. Long sensitive appendages apparently serve the purpose of warning the fish when the delicate lower fin is in danger of touching some hard substance. If seen broadside on the stripes produce the effect of wavering weeds; but the fish can change colour rapidly to fit into its surroundings and the stripes may disappear altogether. This quick change of colour is caused by concentration and expansion of the pigment in the various colour cells known as chromatophores, in the surface layers of the skin. As the pigment in the cells of one colour, for example red, spreads out into many branches, the pigment in the cells of another colour, say black, is contracted and the animal which a moment before was black, will change into red.



NASSAU GROUPE OF BERMUDA

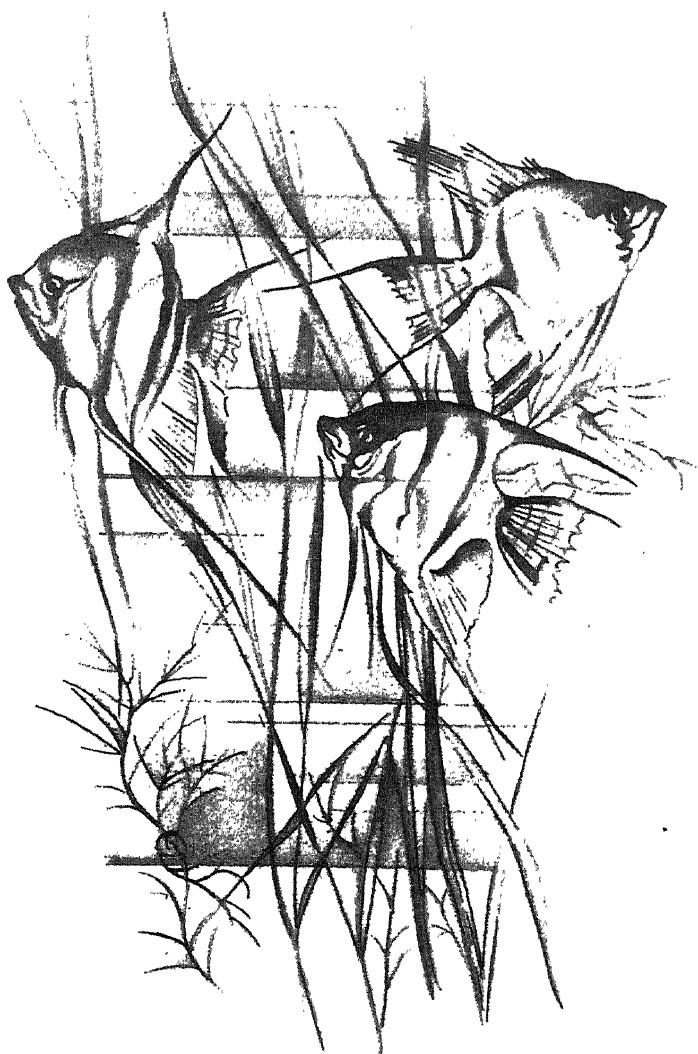
CURIOUS CREATURES

The change of pigmentation is under nervous control and the stimulus is usually received through the eyes. Colour changes, however, are not only a protective reaction, for temperature, darkness, hunger or excitement can affect the colour cells as well as the light. But whatever the stimulus the effect is always the same and displays a great and striking variety. Many tropical fish, for instance, can vary not only from one colour to another but from a uniform tint to spots and blotches. An example of this dazzling transformation is shown in the illustration of the Nassau Grouper, a fish of Bermudan waters. In one figure the fish is seen as a dull lead colour while in the other it is seen spectacularly banded and marbled with pure white, a change which takes place in only a few seconds.

Probably the most perfect example of protective colour display is demonstrated by another sea-dweller, the Octopus. The capacity of this mollusc for changing colour is immense and ranges from a dull crimson hue through an elaborate zebra pattern to a grisly grey. Innumerable pigment cells, crowding its skin, produce a succession of colour changes as an integral part of its make-up. The Octopus provided with a conspicuous pair of eyes can, in fact, adapt itself to almost any surroundings with a rapidity that leaves the notorious chameleon far behind, for the chameleon, placed among bright green leaves, takes nearly fifteen minutes to change from a dark hue to the green colour.

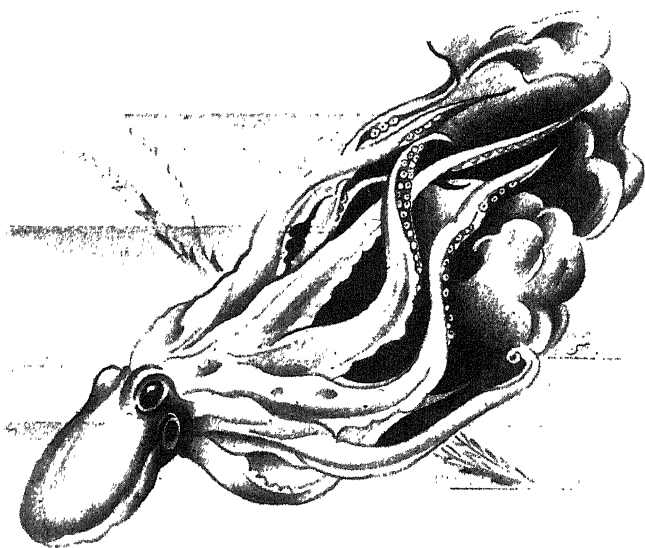
The amazing Octopus with its eight arms, which bear some three hundred cup-shaped sucking discs, is capable of protecting itself by yet another form of camouflage. Its last line of defence is to eject a cloud of ink through an opening known as the funnel. This ink, generated in a special gland, is stored in a sac. It discolours the water for a great distance around and is a device comparable with the smoke screen used in modern warfare.

The Octopus lives exclusively on shell-fish. When a crab comes in sight the Octopus unrolls one arm in its direction and,



ANGEL FISH

CURIOUS CREATURES



OCTOPUS

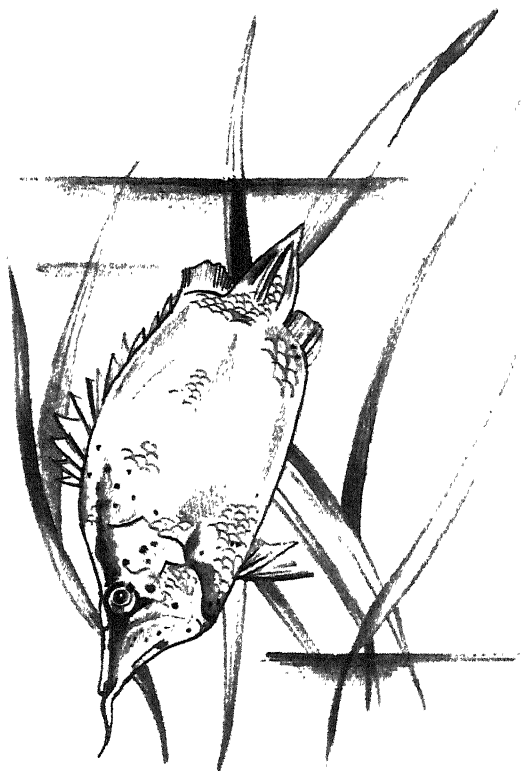
attaching the tip to the crab's shell, seizes the unresisting prey. The shell is removed and the flesh is passed to the horny parrot-like beak situated in the centre of the eight tentacles.

Octopuses are most active at night by virtue of their powerful sight. Joining fishermen on the Dalmatian coast on a still windless night I have often seen these creatures, revealed as in a magic aquarium by the beaming light of the boat-lamp giving a view of more than twenty yards through the translucent water. Nets laid during the night were usually hauled in after sunrise. The catch was sorted out and the Octopuses thrown on one side. As they lay helpless on the shore it was still possible to see rhythmic waves of delicate colours flushing over the tender skins. In a last desperate effort clouds of ink were ejected on the dry hot stones; then they faded out and all that remained of the fascinating display was a dead, grey, formless mass.

ANIMAL CAMOUFLAGE

The essence of camouflage is no doubt the endeavour to survive by escaping detection. It can, nevertheless, very often serve a double purpose and the small and defenceless are not the only animals to make use of disguise. Pretence can also be used, and often is, for aggressive purposes by many hungry hunters.

Various predatory fishes have malicious ways of approaching their victims. The South American, dark brown Leaf-Fish,



LEAF-FISH RESEMBLING A DEAD LEAF

CURIOUS CREATURES

Monocirrhus polyacanthus, resembles a dead leaf in both colour and shape. The illusion is increased by the short barbel on the lower jaw, which simulates the stem of the leaf, and by the fish's habit of floating either on its side near the surface of the water or with its body curved downward as shown in the illustration.

The Leaf-Fish is a member of the *Nandidae*, a family in which the hind parts of the dorsal and anal fins are transparent so that there is no appearance of muscular movement. This feature, no doubt, underlines the disguise, and a dead leaf is certainly of little attraction to any predatory fish in search of food. This camouflage, however, is also used for hunting its own food as the methods of this fish show.

Recent observations published by the G. Shedd Aquarium in Chicago state: 'If a small fish is introduced into the Leaf-Fish tank, the floating "dead leaf" starts to drift with an almost imperceptible motion towards the victim, seemingly as if propelled by some vagrant current of water. If the little fish is alarmed and dashes off in another direction, the Leaf-Fish slowly drifts around and gradually approaches its victim again. When close enough to strike, the dead leaf suddenly comes to life, darts at the little fish, at the same time opening a surprisingly large mouth, and with one gulp all is over.'

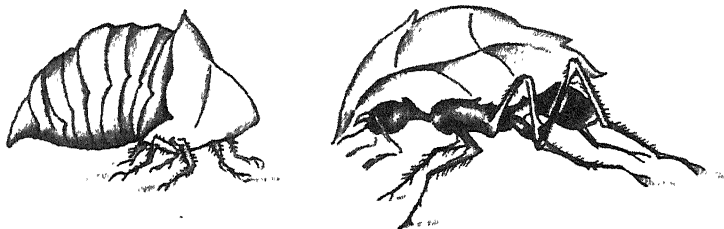
This fish, a well-concealed, floating 'leaf', takes nothing but live food; a camouflaged aggressor, even in captivity.

All over the world there are different insects resembling dead leaves. In the case of the Ceylonese Walking Leaf there is indeed a complete cryptic resemblance throughout all the stages of its existence, the camouflage being one of the most extraordinary found among insects. Unlike its ferocious cousin, the Praying Mantis, it is a gentle leaf-eater. Its eggs look just like shrivelled, spiny seeds. When the young insects emerge they are wingless, reddish in colour and almost impossible to distinguish from the buds of branches upon which they usually feed.



CEYLONESE WALKING LEAF INSECT

CURIOUS CREATURES



A BUG IMPERSONATING A SAUBA ANT CARRYING A LEAF

The green body of a fully-grown Walking Leaf is shaped and veined in precise replica of a leaf, even with imperfections such as holes and spots. The legs are flattened to appear like smaller leaves and are stained rust or yellow, with ragged edges, as if injured by nibbling insects.

Walking Leaves are defenceless creatures of slow habits. They are able to remain still for the greater part of daylight hours. Indistinguishable from the leaf of which they are a perfect imitation, the only movement they make is an occasional trembling like agitated foliage.

One particular form of camouflage widespread among insects is that of mimicry, by which is meant the imitation of one living creature by another. The functions of mimicry are varied. Most often the mimic imitates an animal which, in contrast to itself, is feared by others on account of its distasteful or pugnacious qualities. In order, however, that the mimic may really benefit from its resemblance both it and the model must inhabit the same locality and must show similarity in habits.

In the illustration can be seen the resemblance between two insects belonging to very different groups. A defenceless plant bug, *Rhynchota homoptera*, has developed a green hood which, in colour and shape, conforms exactly with the Leaf-Cutting Ant carrying its piece of leaf along its back.

Both bug and ant are found in British Guiana. The ant is a member of the Sauba Ants which have the habit of growing

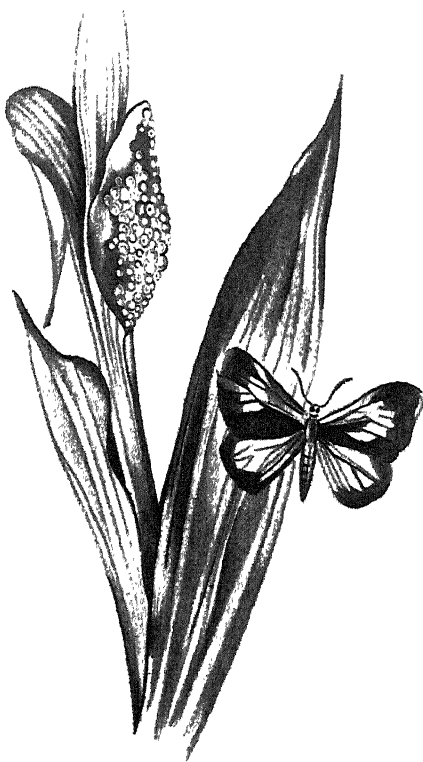
ANIMAL CAMOUFLAGE

mushrooms in their nests. They cut pieces of leaf from surrounding plants and take them back to their colonies where the leaves are chewed to a pulp and used as a mould on which to grow a special fungus which constitutes the exclusive food of these ants.

When collecting leaves, the Sauba Ants may sometimes be seen in procession, each carrying a piece of leaf on its back. Well concealed with its imitation leaf, the bug marches with them and, in pretending to be what it is not, is giving a dazzling performance of mimic resemblance.

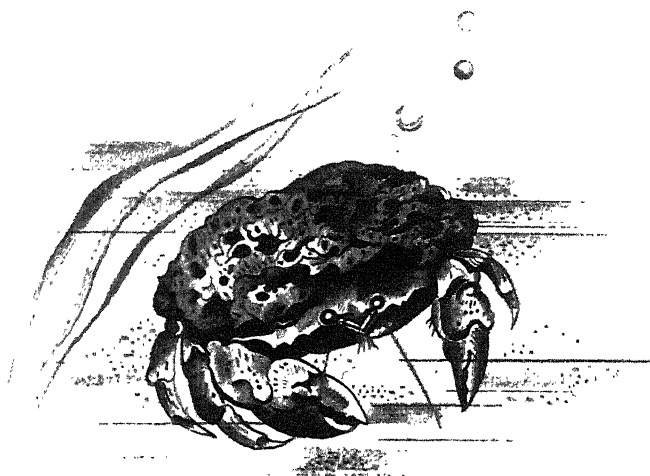
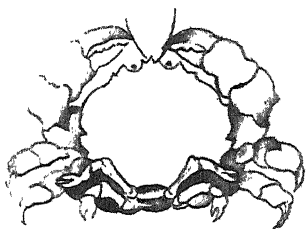
Among the many devices used by insects for their protection against enemies one of the most important is that of protective covering. Caterpillars and larvae construct for this purpose all kinds of cases, cocoons, leaf-rolls, scum and froth bubbles. When it comes to concealment, one of the most extraordinary artists in this technique is the caterpillar of a West African moth, *Nyctemera apicalis*.

Like many of his kind he has dangerous parasitic enemies which have the habit of boring through the side of a cocoon and laying their eggs in the body of the enclosed caterpillar. When the caterpillar is fully grown the par-



NYCTEMERA APICALIS AND
ITS INGENIOUS COCOON

CURIOUS CREATURES



SPONGE CRAB

asitic larvae devour him, then force their way out of the cocoon and start to spin clusters of tiny froth-like cocoons for themselves on the outside.

To prevent these enemies from breaking into his case the *Nyctemera* caterpillar evolved an ingenious defence. In spinning his cocoon he produces from his body a series of frothy, cream-coloured bubbles. As each is formed he winds a few strands of silk around it, drags it off and attaches it to the out-

ANIMAL CAMOUFLAGE

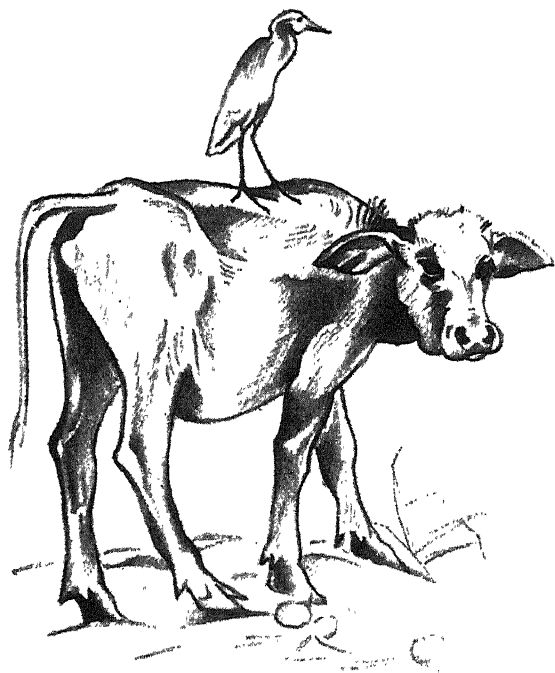
side of the cocoon. When the work is completed these tiny bubbles on the outside of the cocoon are an exact replica of the cocoon clusters made by the parasites, giving the impression that invasion has already taken place. Here is an excellent example of camouflage by constructive imitation.

It has been seen that, as in the case of the plant bug, some mimics come into the world already dressed for their part. Other creatures dress themselves, selecting a camouflage suited to their individual needs.

Such is the case of the Sponge Crab, *Dromidia antillensis*, which has solved the problem of meeting the hazards of the tropical ocean in rather spectacular fashion. In order to resemble the bottom of the sea more closely she provides herself with a covering of sponge. She cuts this protective coat to fit her oval back exactly and holds it in position above the shell with the last pair of her hind legs bearing nippers as shown in the illustration.

Thus clothed with part of another animal, she merely pulls in her limbs when danger threatens from overhead and presents to her enemies nothing but a tough and unappetizing surface of sponge, full of spicules.

This 'make-up' of the crab demands a special effort since she has to provide herself with a new covering each time she moults and grows larger. As the animal world is a hungry one this effort is very necessary; it is essential for each member to appear inconspicuous either for its own defence or in its struggle for food. The various forms of camouflage are dominated by the impulse of survival and every action is governed by necessity, no more, no less.



WATER BUFFALO AND CATTLE HERON

CHAPTER XI

SYMBIOSIS AND PARASITISM

ANIMALS rarely live in solitude. In their struggle for existence they are all more or less dependent upon each other, for good or for evil, but quite often some may form either temporary or life-long partnerships with creatures of totally different kinds. Symbiosis, a Greek word from *sym*, together, and *bios*, life, describes a condition in which two organisms live together in an intimate relationship of some sort

SYMBIOSIS AND PARASITISM

of mutual benefit. There are different grades of parasitism in which animals live together; some may be beneficial and some injurious. In pure parasitism, however, the benefit is exclusively one-sided, the guest living entirely at the expense of the host.

Not infrequently birds associate with large mammals, and in the case of the Rhinoceros Birds, *Buphagus*, the relationship with many animals, both wild and domestic, is certainly of great advantage to both sides. In the illustration a whole party of these birds is shown relieving a Kudu cow of the parasites infesting her body. The hostess is far from being excited; indeed, she does not try to drive the birds away but behaves peacefully and patiently towards them. The birds run and hop



RHINOCEROS BIRDS ON A KUDU COW

CURIOUS CREATURES

over the antelope's body in the most lively fashion, searching every part for food. In so doing they not only satisfy their own hunger but also destroy the parasitic insects which plague the beast. Besides this useful work the Rhinoceros Birds, which are wonderfully quick in observing distant objects, warn their four-legged friends of approaching danger. When alarmed they rise and circle above their host, uttering loud and wild cries. This is certainly an excellent partnership, pleasing all except, perhaps, the parasites.

A similar friendship exists between the Cattle Heron, *Bubulcus lucidus*, and the Water Buffalo. Riding on the backs of their hosts, the elegant egrets actively remove the annoying parasites while the buffaloes themselves, according to the natives of Celebes, greatly welcome these snowy-white birds with their shell-pink bills and olive-green scaled legs. Always hungry these birds follow the herds with harsh and maddening cries. In Africa the little Cattle Egrets do not hesitate to ride on animals such as the Rhinoceros and the Hippopotamus, digging out from the hides of their gigantic partners such parasites as ticks and warble-flies.

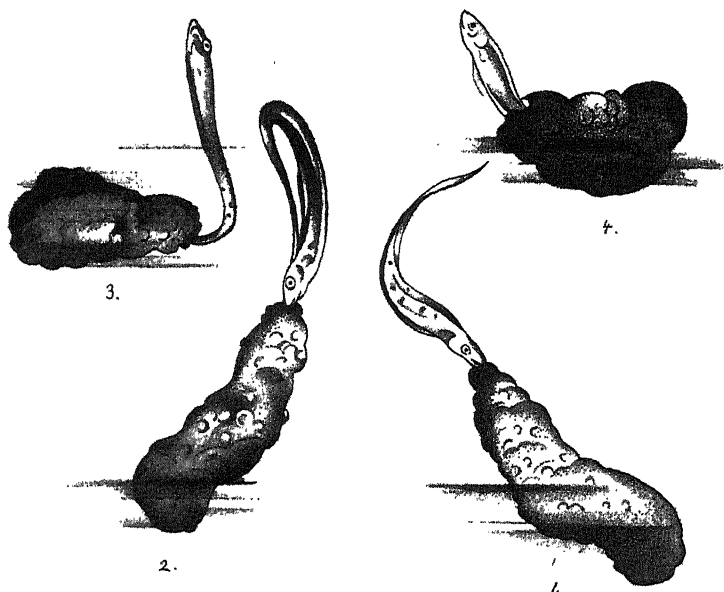
It frequently happens that even small animals are able to protect larger ones from enemies of a formidable size. Such a strange and successful relationship has been observed between the Mexican Oropendolas, members of the blackbird family, and some tropical wasps. Oropendolas build numerous elaborate nests about six feet long which sway from the branches of tropical trees. The eggs in these nests are looked upon as a choice food by many of the birds' enemies such as the ocelots, the monkeys, the lizards, the raccoons, and the opossums, all of which are experienced nest raiders. Keen tree-dwellers themselves they can easily reach the eggs or the fledgelings, even at a great height.

To overcome this serious menace the Oropendolas build their nests in the same tree as that of a large colony of tropical wasps. These insects, in no way disturbed by the birds'



MEXICAN OROPENDOLAS AND TROPICAL WASPS

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FIERASFER FISH SEEKING SHELTER IN A SEA CUCUMBER

activities, are aroused to anger if any intruder tries to raid the tree, and no animal, however fearless or hungry, would be prepared to risk vicious attacks from the wasps. Since the *Oropendolas* always ensure that the wasps' nest is between their own and the tree trunk they enjoy a protection from their fellow residents which means security for their homes and for their offspring.

It is not only on the ground and in the trees that mixed partnerships occur. In the sea many defenceless creatures seek shelter, strangely enough, in the bodies of larger animals. A little eel-shaped fish related to the blennies, for instance, has the habit of lodging within the bodies of those marine animals known as *Holothurians* or Sea Cucumbers. The fish, the *Fierasfer*, derived from a Greek word meaning sleek and shiny,

SYMBIOSIS AND PARASITISM

gets its name from its transparent glass-like body marked only by a few scattered dots. The method used by the Fierasfer to take up residence within a Mediterranean Sea Cucumber is shown in the four figures of the illustration. He first searches for the animal's hind part where he attaches himself by his head. Then, bending the body, as in Fig. 2, he inserts his tail into the opening. The body is again straightened, Fig. 3, and the fish wriggles himself backwards until he is completely enclosed within his host and, as shown in Fig. 4, well-established. It is presumed that in this procedure the fish is helped by the respiratory current of water produced by the Sea Cucumber's lung-sacs which, together with the intestine, end in the anus. This living shelter can be occupied by several fishes at the same time and no less than seven of these sleek Fierasfers have been seen to enter a *Holothuria* one after the other.

During the day-time the Fierasfers remain hidden in the leathery-skinned Sea Cucumber, but at night they sally forth in search of the small crustaceans on which they feed. The unfortunate sausage-shaped echinoderm derives no benefit from its lodgers and receives no reward for services rendered. Observations in aquariums, however, confirm that *Holothurians* are not much irritated by their squatters and do not eject their internal organs, a common practice when frightened or disturbed. The sticky mass affords protection from enemies and the animal, a master of regeneration, quickly develops a new set.

A different choice of borrowed home is made by the Hermit Crabs which vary in size from tiny individuals using shells hardly larger than the head of a pin to giants carrying homes as big as a grapefruit. The principal feature of the Hermit Crab is his incomplete armour. The powerful pincers, the claws, the legs, the fore and the middle part of the body are all covered with a horny substance, but the remainder of the body is soft and defenceless. It is to protect this vulnerable 'tail' that the Hermit Crab adopts for his own use empty shells of other

CURIOUS CREATURES

marine animals. The abdomen is inserted and anchored within the shell and can be removed only by the animal without difficulty.

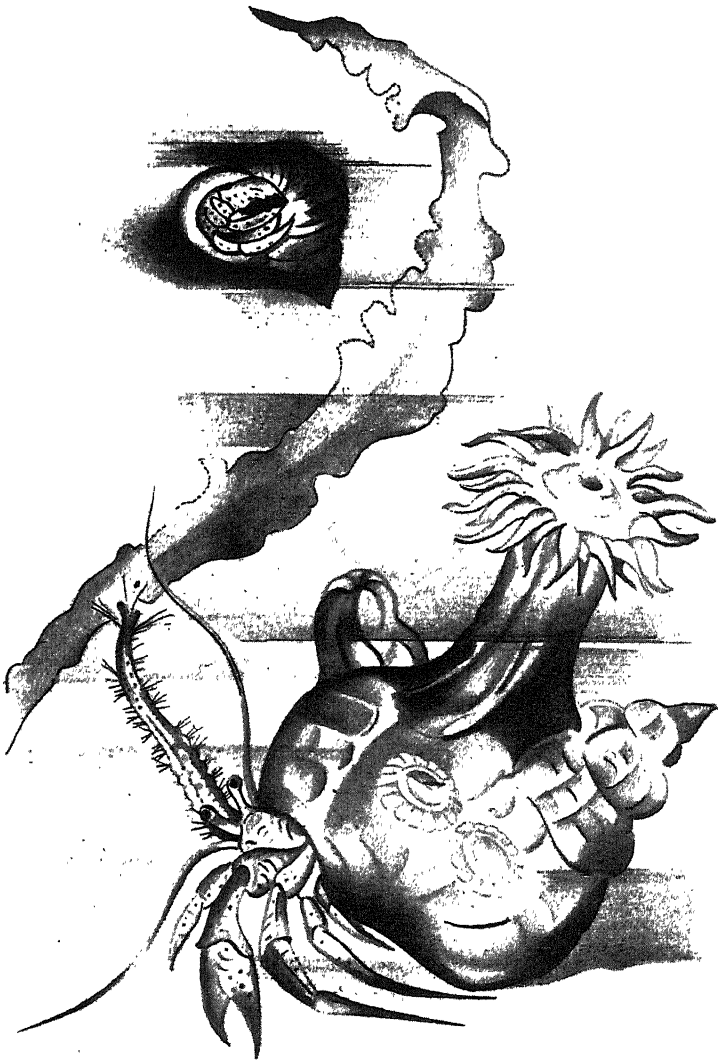
As the crab grows, one shell is exchanged for another, slightly larger, and frequent transfers are made until the crab reaches full maturity. It is rather amusing to watch a Hermit Crab investigating a number of empty shells with his claws and, having decided to shift, whipping his tail out of the old house and into the new with a haste eloquent of his fear of being attacked in the rear.

Despite having protected his fleshy body in this way, the Hermit Crab is still faced with the possibility of attack from other desperate characters of the sea who are ready to seize both him and his borrowed shell. He therefore finds it to his advantage to have an anemone riding on his shell, for the stinging power of his partner is likely to be sufficient to discourage most assailants. The anemone, although able to crawl, is a very slow-moving creature and therefore benefits from the free and quicker transport to fresh feeding grounds on the crab's shell. This is an example of external partnership known as commensalism wherein one animal helps another.

Hermit Crabs are usually ridden by different kinds of anemones. When moving house they often transplant their partners to their new abode. In the case of Prideaux's Hermit Crab and the Cloaked Anemone the crab's shell is gradually absorbed by the anemone until the crab is enclosed in a protective tunic of unlimited elastic capacity, obviating the necessity for the crab to change its home as it grows.

In the illustration the Common Hermit Crab is shown in the shell of a mollusc which carries several Sea Anemones and some small Barnacles. A Bristle-Worm which sometimes lodges in the same shell merely feeds on the floating food scraps of the Hermit — without paying any contribution towards its keep!

In contrast to this successful working arrangement for mutual benefit between the Hermit Crab and the anemone,

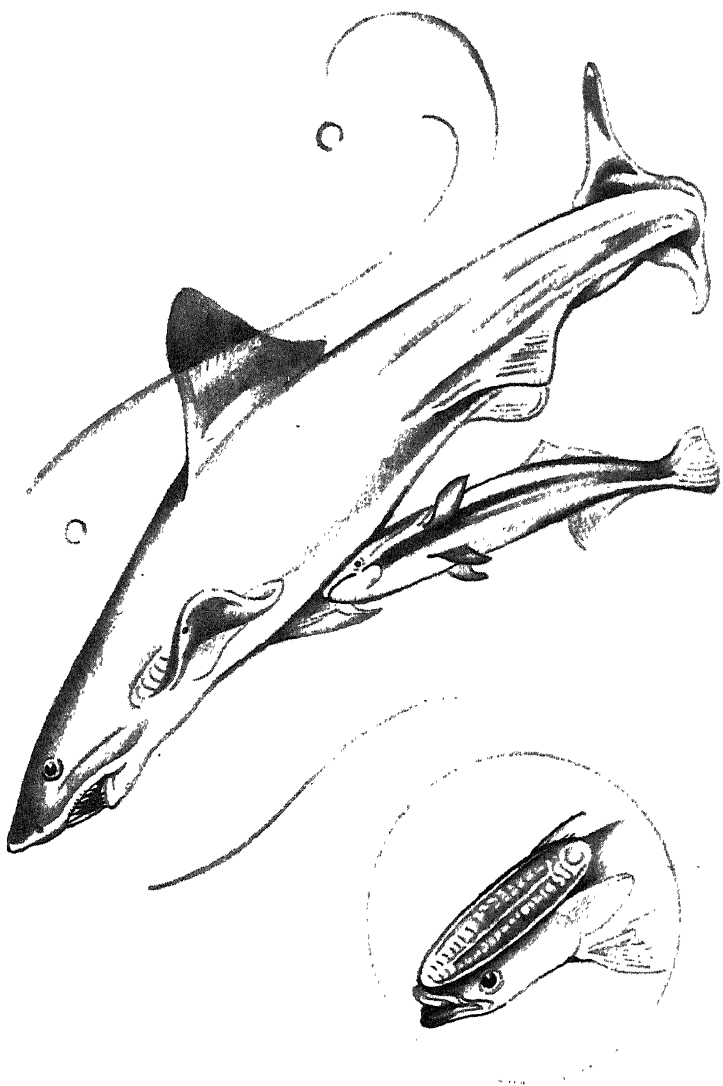


HERMIT CRAB AND SEA ANEMONES

CURIOUS CREATURES

the association of two other sea creatures is entirely one-sided. A fish closely connected, in more senses than one, with the Shark is the Remora — sometimes called the Sucking Fish on account of the curious oval-plated sucking disc on the top of its head and shoulders by which it can affix itself firmly to any object. In their search for a free passage the Remoras very often attach themselves to the Shark, and in this way are not only protected from their enemies but are carried without effort to fresh feeding grounds. Once among a shoal of small fry they detach themselves and feed until their appetites are satisfied, after which they search for new anchorages. The Sharks, although carrying the Remoras through vast areas of tropical seas, derive no benefit from the association; they cannot even devour their passengers which remain out of reach of the formidable teeth of their host.

The capacity of the Remora for fastening itself to any object is amazing and the vacuum created is so powerful that a 'moored' fish weighing only one and a half pounds has been used to lift a sixty-three pound turtle. This method of fishing for turtles and other sea animals with the Remora was witnessed by Columbus in the West Indies and is still practised by the natives of various countries today. The hunting method used by the aborigines of the Barrier Reef has been described by N. J. Berrill of McGill University. He says: 'They fasten the captured fish by the tail and keep it in shallow water until it is time to hunt for turtles. In leashing the fish, a hole is made at the base of the tail fin by means of a turtle bone, and one end of a very long piece of string is inserted and made fast to the tail. A short piece of string is also passed through the mouth and out of the gills, securing the head end, and the fish is slung over the side of the canoe. When a turtle is sighted, the short piece is pulled out of the mouth, and away the Remora goes. So long as the line is kept taut the Remora cannot let go of anything it has caught, and the size of the turtle or fish that can be captured is limited only by the strength of the line and



REMORA OR SUCKING FISH ATTACHED TO A SHARK

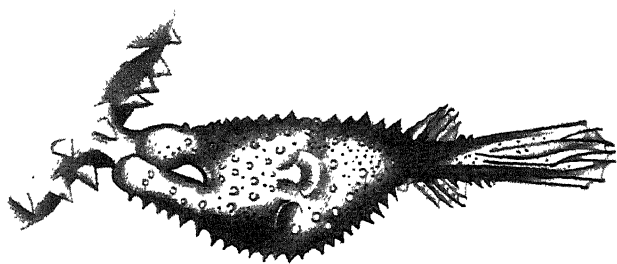
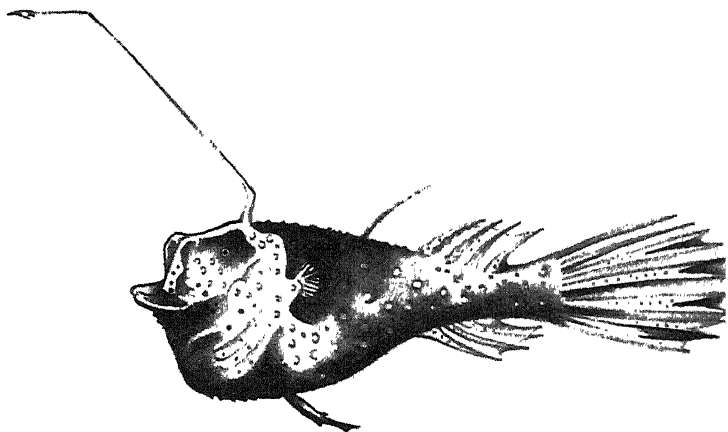
CURIOUS CREATURES

the breaking strain of the Remora itself.' Thus does Mr. Berrill pay tribute to the skilled employment of the Remora, and he goes on to disclose the fact that the ungentle Australian aborigines celebrate the end of a successful day's fishing by eating the Remora.

In most living creatures the male and the female are much alike, but in the case of certain Oceanic Angler Fish the male is only one tenth of the size of the female. This group of fishes, the Ceratioids, is most remarkable in that all the free-swimming fishes are females and the dwarfed males are just joined to them. The habits and conditions of life of these sluggish flesh-eating creatures, which float about in the darkness of the ocean, make it evident that the mature fish would probably find it difficult to seek out a mate. Consequently, as soon as they are hatched, and before their numbers are reduced by predators, the more numerous males begin their search. In this early larval stage they seem to have a greater chance of seizing a female, and if they are successful in their quest they hold on to her and thenceforth become parasitic. They first hold on by the mouth; then the lips and tongue become fused with the skin of the female and the two fishes become completely united so that the male is a mere appendage of his wife, nourished by her blood stream. This strange union is permanent; if the female dies the male dies with her. The site selected for attachment is quite haphazard and occasionally more than one male becomes attached to a single female.

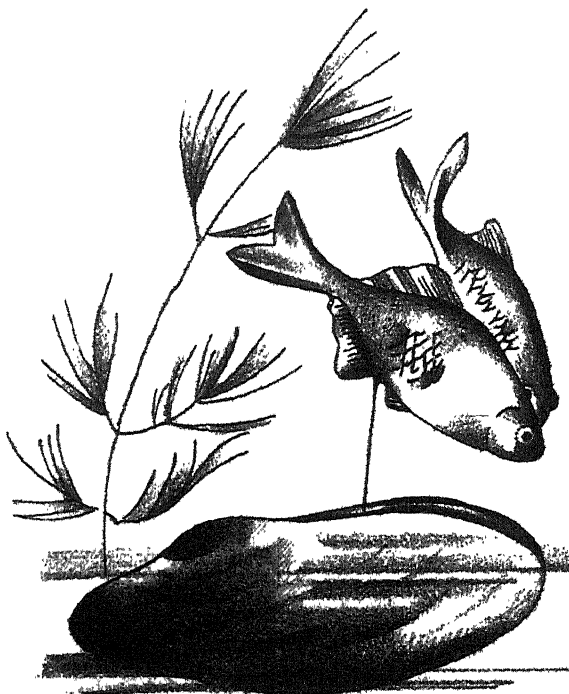
The female Angler Fish illustrated is *Ceratias holboelli* which is remarkable for the spiny skin and the long, flexible rod bearing a short line. She reaches a size of about forty inches while the male attached to her abdomen is not more than four inches. The lower drawing shows the toothless male in complete union with the body of the female.

It is of interest to note that the last two examples have been of fishes associating with their own kind. There are, however, fishes which associate with animals of a much lower grade.



OCEANIC ANGLER FISH
Below: CLOSE-UP OF THE PARASITIC MALE

CURIOUS CREATURES



MALE BITTERLING PUSHING THE FEMALE
TO DEPOSIT HER EGGS IN THE SHELL OF
A FRESH WATERMUSSEL

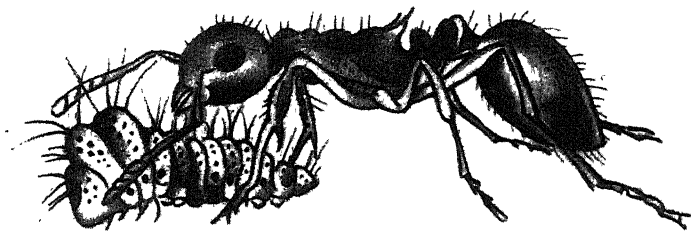
Such is the case of the Bitterling, *Rhodeus amarus*, and the Common Freshwater Mussel. The Bitterling is a small fish related to common freshwater fishes like the roach and the carp. To ensure the safety of its offspring the Bitterling takes most unusual precautions. The female, in the breeding season, develops a long egg-tube or ovipositor by means of which she plants her eggs within the mussel's valves where they are out of reach of enemies. There after being fertilized by the male they undergo their development, the respiratory current of

SYMBIOSIS AND PARASITISM

water produced by the mussel serving to aerate the eggs. After a month the hatched-out fry leaves the mussel.

This process seems to be of no advantage to the mollusc, but it so happens that the bivalve has a chance of equalizing the score when it comes to spawn. The minute young, which are ejected from the shell, attach themselves with long, sticky filaments to passing fishes and then anchor themselves to their reluctant hosts by means of additional hooks on their valves. There they remain encysted until sufficiently advanced to return to the bottom of the stream to lead the life peculiar to their species. In the majority of cases their attachments are to Bitterlings and a rough and ready interdependence is thus formed.

Among other partnerships of the animal kingdom the most unlikely that one could expect exists between a butterfly and an ant. The Large Blue Butterfly, *Maculinea arion*, begins its career as a little pinkish caterpillar, feeding on the flower buds of wild thyme. After the third moult, however, the syrup-secreting gland at the end of its body attracts an ant which strokes and milks it. The caterpillar, apparently pleased by the procedure, puffs up the fore part of its body as a signal that it wants a lift. When this occurs the ant, *Myrmica laevimodis*, seizes the caterpillar with its mandibles and carries it off to its nest, and the journey is sometimes a long one. In the ants' nest the caterpillar does not seem to cause the least commotion and as



ANT MILKING THE LARVA OF THE
LARGE BLUE BUTTERFLY

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ICHNEUMON FLY
DEPOSITING EGGS
BENEATH THE SKIN
OF A PUSS MOTH
CATERPILLAR

a payment for the sweet liquid drawn from itself, takes to feeding on the ants' own offspring. Hibernating in safety during the winter, the caterpillar changes in spring into a chrysalis, and finally, in order to reach the sun and the outer world, makes its way through the long underground galleries as a blue fairylike butterfly. It was Frohawk, author of a splendid book on British butterflies, who in 1905, after twenty years of research, succeeded in solving the whole mystery of this amazing partnership which serves ant and larvae equally well.

Numerous larvae and pupae of butterflies and moths suffer greatly from the attacks of parasitic insects. In Britain alone several thousand species

of these parasitoids are found, and the relationship with their hosts provides one of the most exciting chapters of insect biology. They are all members of only two orders, the Hymenoptera, including bees, wasps and ants, and the Diptera, including the true two-winged flies. The hosts of all these insects are always other insects which may be parasited in any stage of growth from the egg to the fully-grown adult.

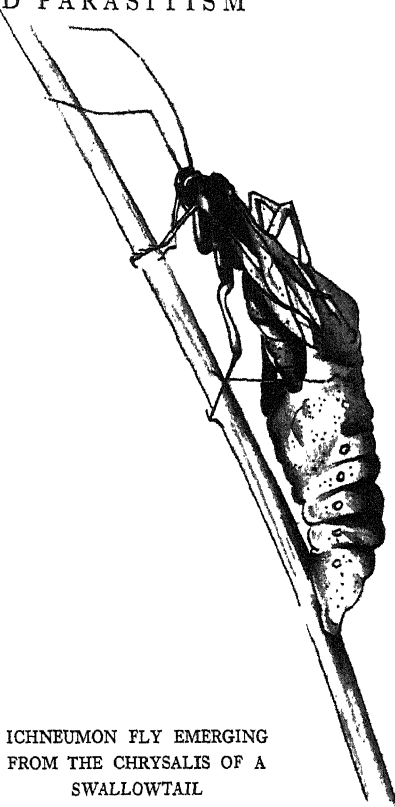
Among the Hymenoptera the most characteristic parasites are the Ichneumons and their relatives. These highly-endowed solitary insects have an extraordinary instinct for the discovery of their prey, and on account of their destructive

SYMBIOSIS AND PARASITISM

capacities they are most valuable allies of man, acting as natural agents in keeping the swarms of plant-eating insects to manageable proportions. In the illustration an Ichneumon Fly, the Yellow Ophion, is shown piercing the skin of the Puss Moth Caterpillar which has vainly tried to scare off the intruder by puffing itself up and ejecting a squirt of formic acid. Undaunted, the Ichneumon Fly, using the sharp ovipositor, injects her eggs beneath the skin of the unhappy caterpillar, and in the course of time the developing Ichneumon grubs eat their host alive.

Another example of the deadly activity of these narrow-waisted parasites is shown in the illustration of an Ichneumon Fly emerging from the chrysalis of a Swallowtail.

The green caterpillar of the Swallowtail Butterfly has been stung in a way similar to that of the Puss Moth, and the larva of the attacker, well protected, hatched in the victim's body. The ravages, however, are so skilfully timed that the caterpillar is not killed before it turns into a chrysalis. Only then does the parasitic larva devour the vital organs of the chrysalis and go through her own pupation within the sheltered case of her vanquished host. This drastic form of self-preservation shows just once more that life for the one very often means death for the other.



ICHNEUMON FLY EMERGING
FROM THE CHRYSALIS OF A
SWALLOWTAIL

CHAPTER XII

INSECTS OF STRANGE FORMS AND HABITS

THE insect world, so inexorably bound up with our own, is full of interest and strange beauty. These creatures, exhibiting an infinite variety of queer habits and bizarre forms, can justly claim a history on earth very much older than that of man. Whilst man is supposed to have an antiquity of perhaps one million years, the first insects had already appeared in the warm carboniferous period some 290 million years before man made his bow. Dominant forms then in flight were dragonflies, the giant *Meganeura* reaching a wing-span of over two feet.

Today insects form the greatest part of the animal kingdom. Among the many 'personalities' in this vast throng the Mantidae, the praying insects or soothsayers, have always attracted special attention for their strange appearance and world-wide reputation for piety and wisdom — a reputation undeservedly enjoyed for very many years.

There seems to be little doubt that it is the characteristic resting position of these insects which has given rise to the superstitions. The Mantis, standing on four of its six legs, raises the long, neck-like front part of its body, casts its dark eyes heavenwards, and uplifts its fore limbs as if in supplication. Thus it remains for hours on end, motionless. This devotional posture was so impressive that the Mantis was credited with divers powers and virtues. The ancient Greeks believed it to be engaged in meditation on futurity and bestowed upon it the name Mantis — diviner. Pious people in the Middle Ages declared it to be rapt in prayer, and to this day in many parts of Southern Europe the Mantis is known as *prie-dieu* and *prega*



PRAYING MANTIS CAPTURING A BLACK WIDOW SPIDER

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diou — a worshipper of God. In the East, Turks and Arabs assert that the Mantis always 'prays' with its face turned towards Mecca. Modern naturalists, however, no longer impressed by the pious attitude of the insectivorous diviner, have revealed its true character, that of one of the most savage and bloodthirsty creatures of the insect world. They often refer to this slender, almost prehistoric-looking insect as 'the dinosaur of the garden'.

When seemingly absorbed in profound meditation, the Mantis is actually engaged in keeping a keen look-out for something to kill and to devour. As soon as an unsuspecting insect alights nearby the Mantis steps towards it, moves the great saw-toothed fore legs with lightning speed and like a steel trap they snap shut over the victim. With its jaws the Mantis then tears its prey apart piecemeal, but soon the vicious trap is uplifted anew patiently waiting for the next victim. When finally its voracious hunger is satisfied it washes its face like a kitten; when thirsty it bends down and drinks water in the manner of a horse. The Mantis is in fact the only insect that can turn its head and look over its shoulder in the same way as man.

While a Mantis never attacks man or beasts, feeding on insects only, it has, nevertheless, infinite courage, and some of the big tropical species are said to be capable of tackling small birds and frogs. The most unusual event, however, in the lives of these insects is the cannibal feast which ends the mating which, since Mantids live for only one summer, happens but once. It is the larger and heavier female that attacks and devours her slender, swaggering mate, consuming all but the bony legs and the inedible wings. This *crime passionel* has been observed many times and the famous French biologist, J. Henri Fabre, tells of a female Mantis that started eating its lover while still in the act of mating. Experimenting with a big Mantis common in Japan, two entomologists, Aoki and Tateishi, carried this observation a stage further. They revealed that decapitation actually stimulates the mating reaction of the male, and that

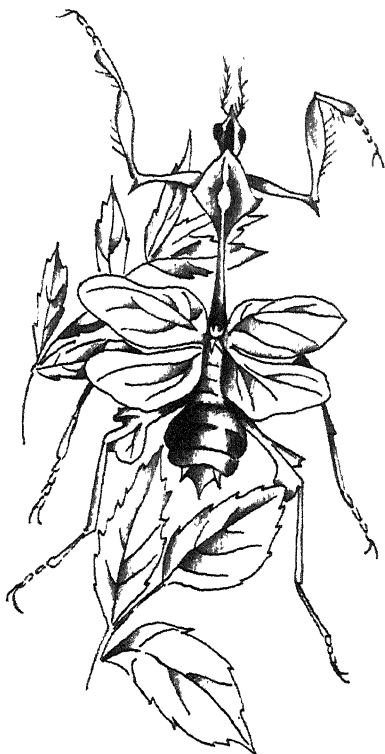
INSECTS OF STRANGE HABITS

the supreme sacrifice does not interfere with the consummation of his functions. Other experiments showed that ten hours after his head was bitten off the amazing lover still moved his legs and lifted his wings when touched.

There are perhaps some six hundred different species of Mantids distributed over the warmer parts of the world ranging in size from one to six inches. Although they are usually a delicate green in colour to blend with the foliage, many have brightly-coloured hind-wings which are concealed beneath the leaf-like fore-wings when the insects are at rest. Some species have, in addition to the leaf-like fore-wings, leaf-like extensions on their legs, while others are so flower-like in shape and colour that even butterflies are deceived.

For instance, the species *Gongylus* from Southern India matches the brilliant hue of the flower which it imitates. This effect is completed by the size and general outline and by the habit of this Mantid of seeking out plants that resemble its particular hue. Having found a suitable resting-place it awaits, well concealed, its unsuspecting victims.

The Stick Insects, *Phasmidae*, are totally different in character from the insatiable, greedy Mantidae, although in appearance they are even more queerly shaped. Being feeble, timid crea-



GONGYLUS GONGYLOIDES
POSING AS A FLOWER

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tures they have evolved a remarkable disguise to enable them to escape observation. Whilst some look like bare sticks or rough brown twigs, others resemble tender green plant stems. No matter how strange they may look they always conform entirely in shape and colour to the natural objects among which they dwell, moving so slowly that the illusion is seldom destroyed. Living exclusively among twigs, most of them never descend to the ground and even drop their seedlike eggs to bounce from leaf to leaf until they finally lie on the ground. From each of the numerous eggs a new Stick Insect emerges by a private lid.

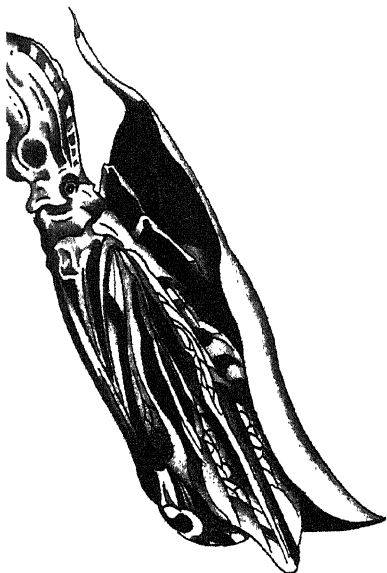
Stick Insects are vegetable feeders and vary in size from one to ten inches in length, some tropical species even more. Many forms are wingless but others possess delicate, brightly-coloured wings which are not conspicuous when the insects are at rest. A complete concealment seems to be achieved by one species by means of leaf-like extensions on the legs and body looking like the remains of foliage after being raided by greedy caterpillars. Another peculiarity of all members of the Phasmidae is their ability to replace lost or damaged limbs, although, strangely enough, a lost leg is sometimes replaced by a new antenna or vice versa. No description of these queer insects would be complete without attention being drawn to the fact that in some species the male is very seldom found and that many generations seem to be composed entirely of females. In two common South European Stick Insects males are almost unknown, and an Indian species has been bred for twenty-five years without producing a single male.

Many defenceless insects, in contrast to the bashful Phasmidae, seem to devise a bluff to frighten their enemies. The bizarre Lantern Flies of tropical South America have a protruding snout. This enormously enlarged, hollow, mask-like projection, if viewed through a hand lens, is elaborately patterned and looks like the terrifying head of an alligator. It is rather doubtful, however, whether any of the insect's enemies



STICK INSECT SHOWING ITS RESEMBLANCE
TO THE BRANCH ON WHICH IT RESTS

CURIOUS CREATURES



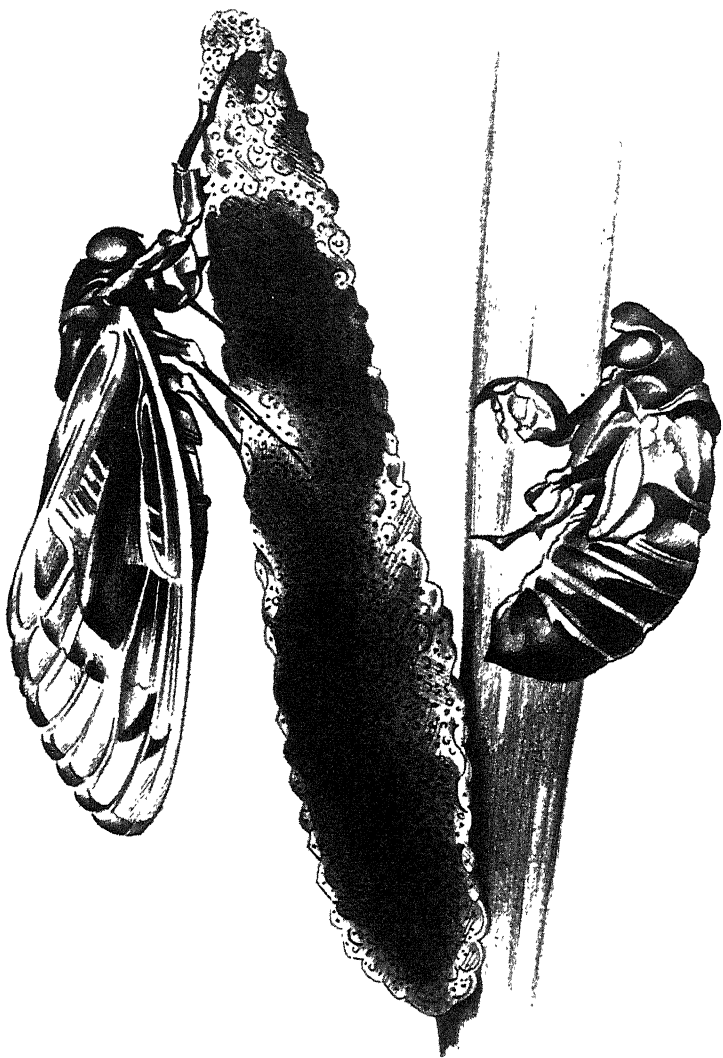
LATERNARIA PHOSPHORA

would be frightened by such a comparison since a specimen seven inches long is large and could hardly be mistaken for an alligator! It was supposed at one time that this huge mis-shapen proboscis is luminous, shining out like a lantern in the dark; but this observation made by Madame Merian in Surinam in 1705 has never been verified. The species illustrated is *Laternaria phosphora*, a brightly-coloured insect of considerable size.

Insects more than any other animals are addicted not only to a queer make-up but

to odd habits as well. In the eastern parts of the United States lives a Cicada which, before emerging as a fully grown Cicada, spends seventeen years as a grub in the earth. No other insect has a life cycle of this length, and the Cicada on the day of its emergence as a mature insect is already something of a Methuselah; for all that, its life as an adult is short and it dies after a brief period of energetic maturity.

Of the fifteen hundred species of Cicadas known to science *Tibicina septendecim* is certainly the strangest. It is commonly known as the Seventeen Year or Periodical Cicada. The eggs of Seventeen Year Cicadas are laid in a twig after cavities have been hollowed out by the females. Soon tiny, pale creatures hatch out and drop to the ground where, on landing, they burrow themselves into the earth and disappear from sight. While life on earth undergoes great and rapid changes the slowly maturing Cicadas dwell underground for more than two hun-



SEVENTEEN YEAR CICADA EMERGED FROM
ITS NYMPH SKIN

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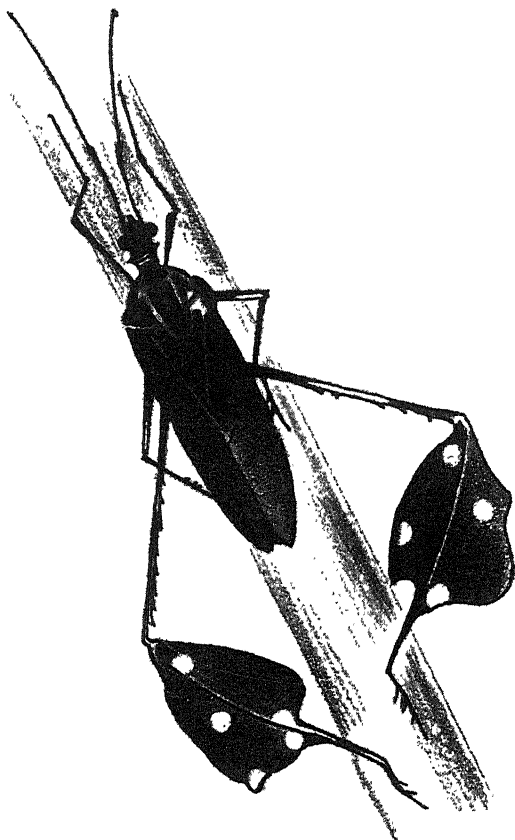
dred months, but one warm and brilliant summer day the nymphs suddenly leave their dark tunnels and climb up to the trees. Here they shed their skins, dry their wings and take to the air as perfect insects with orange-veined wings and red eyes. When this occurs the males, equipped with a pair of drums near the base of their wings, start to produce their shrill, wailing call, and soon mating takes place. After each female has laid about five hundred to six hundred eggs the goal of their long development has been achieved and, with the passing of this short period of sunshine and song, the adult life of the Periodical Cicadas comes to an end. Exhausted they tumble to the earth from which they so recently emerged, and die.

The illustration shows a Seventeen Year Cicada which has just emerged from its nymph skin, and the discarded skeleton is still clinging to the stem on the opposite side.

The South American Bug, *Diactor*, certainly has a less interesting life cycle than the Periodical Cicada. Nevertheless it is remarkable for the leaf-like arrangements of its legs. These adornments are a reddish brown colour with yellow spots, a coloration resembling that of the plants on which the bugs live. The body of this decorative insect is green and its legs a bright orange.

The influence of the activities of insects upon the destinies of man is vast and far-reaching. Among the insects which have caused more death than any other agent the Mosquitoes take first place. They spread malaria, blackwater fever, yellow fever and elephantiasis. Mosquito is the Spanish name for fly and means much the same as the English word gnat. Like that of many other insects the life story of the Mosquito consists of four stages: the egg, the larva, the pupa, the adult. The eggs are usually laid on the surface of the water. The larval period is spent in the water, and the larva, after casting its skin three times turns into a pupa. A few days later the pupa comes to rest at the surface of the water, the skin splits along the back, and the insidious mosquito emerges.

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DIACTOR

Among the Mosquitoes the carriers of human malaria are species of the genus *Anopheles*. No less than a hundred and fifty species of this genus are known, and they are by no means restricted to tropical regions; in Britain, for example, four species of *Anopheles* are capable of transmitting human malaria and the malady is to be found in the temperate zone as well as in the tropics and sub-tropics. Kipling's words 'the female of

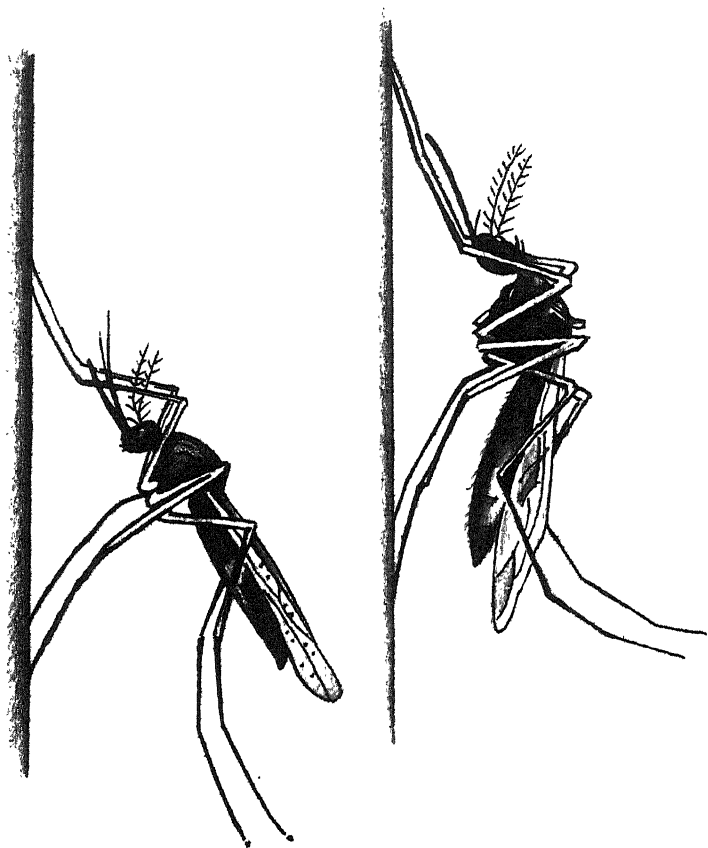
CURIOUS CREATURES

the species is more deadly than the male' certainly apply to *Anopheles*. It is by night that these ladies do in fact perform their deadly work of biting human beings, approaching their victims with a whining song. Should one of these victims be affected with malaria the organisms causing the disease enter the insect with the blood and eventually find their way into the salivary glands. If then, after this development, the same Mosquito bites a healthy person the disease can, and almost certainly will, be transmitted to that person. It was not until 1897 that Sir Ronald Ross made the great discovery which established beyond doubt the fact that Anopheline Mosquitoes are responsible for spreading malaria organisms from man to man, and it was then that war was declared against the Mosquito. Various methods are used to destroy the Mosquitoes in their breeding place like the poisoning of the water with oil or the introduction of natural enemies such as certain fish or insectivorous plants. The latest development in the fight against malaria is D.D.T., which, sprayed from aeroplanes, can be used to clear areas of both adult and larval Mosquitoes.

Malaria, disseminated by Mosquitoes, has played a great part in history. It destroyed the civilizations of ancient Greece and of Rome, and more recently caused a tragic loss of life during the French attempt to construct the Panama Canal. Malaria is still the worst of all human scourges; not only does it kill three million people a year, but in a broad equatorial zone round the earth three hundred million fresh victims are infected every twelve months.

It is not difficult to distinguish a disease-bearing *Anopheles* from an ordinary irritating Mosquito. Among the many points of difference the most noticeable is the position at rest. The illustration shows an Anopheline Mosquito with head lowered and body held in a straight line. The harmless though annoying Gnat, drawn in the same relative position, has a humped back. It does not necessarily follow that every individual *Anopheles* is dangerous, since many may not be infected. On the other

INSECTS OF STRANGE HABITS



ANOPHELINE MOSQUITO AND COMMON GNAT

hand there is not the slightest doubt that the only good Anopheles Mosquito is a dead one.

No matter how curious or peculiar the appearance and attitude of an insect, it will usually be found that these features have some direct relation to its way of life. Yet sometimes we find a similar structure in creatures of different kinds, each

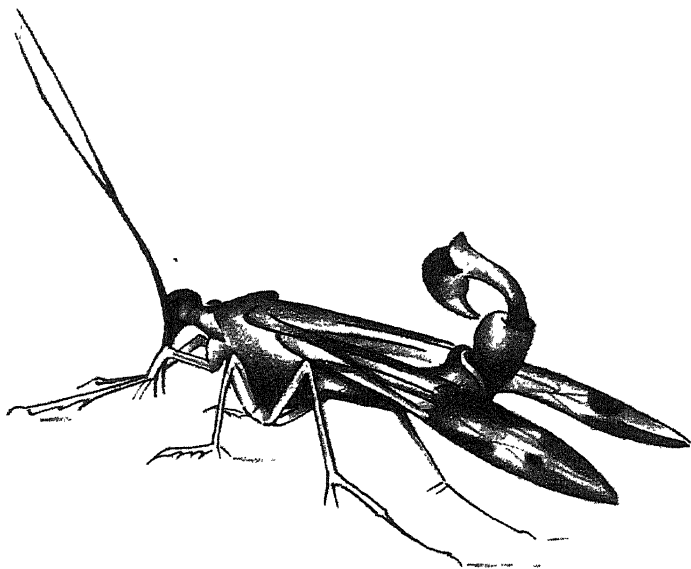
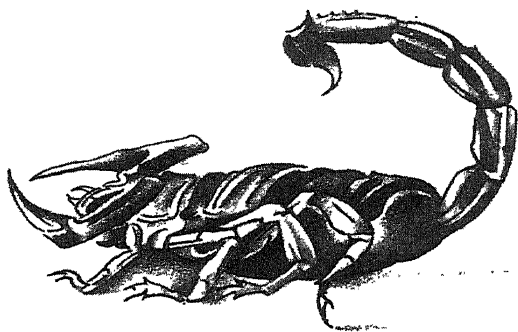
CURIOUS CREATURES

serving its owner in quite a different way. This similarity in form and attitude as found in the six-legged Scorpion Fly, which is an insect, and the eight-legged Scorpion, which is a relative of the spiders, is shown in the illustration.

The common Scorpion Fly, *Panorpa communis*, is a carnivorous insect with four long transparent wings. The head is prolonged into a strong beak which is curved downwards. The most peculiar feature, however, of these insects is the male's habit of holding the end of its body bent back similar to the way in which a Scorpion carries its tail; but whereas the Scorpion has a poisonous sting the curved structure of the Fly's abdomen terminates in a stingless male organ. In spite of its imposing attitude the male Scorpion Fly is far from being safe from his mate's carnivorous instincts, and has to take very careful precautions. To oblige his spouse he offers her a wedding present, little globules of saliva which he spits on the leaves. She generously accepts the gift and starts feeding at once; while she is thus occupied, the act of mating takes place. It has been suggested that if the female Scorpion Fly is fed in this way the inclination to devour her partner once mating has been effected is weakened.

Scorpions are old remote cousins of the insects. Throughout the long history of the earth they have preserved an ancestral likeness to primordial aquatic forms which reigned four hundred million years ago when life had not yet conquered the land. In the present world Scorpions have long enjoyed a reputation for ferocity and venom, due to the fact that they can run at great speed, that they have large pincer-bearing foot-jaws, and that, in addition, they have at the end of the tail a sharp sting supplied by a poison gland. This sting, however, is only brought into operation in self-defence or if any prey or enemy offers resistance, in which case the tail is arched forward over the body to strike the victim held in front.

All the three hundred known species of Scorpions are found in hot and tropical countries, and the fact that they only require



SCORPION AND SCORPION FLY SHOWING THE
SIMILARITY IN FORM AND ATTITUDE

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moisture but never drink makes them suitably adapted for life in these regions. Although some giants reach a size of eight inches in length, only very few are dangerous to man, many species being quite harmless. They all feed on insects and spiders. Their life history is quite simple. In appearance the male is slender and his tail is longer than that of the female. The courtship consists of a dance with interlocked claws and tails held aloft and, after copulation has taken place, the male is often eaten by its spouse. It was Aristotle who observed that baby Scorpions are born alive. From their first appearance they differ from their parents only in size, in colour — they are paler — and in a few minor details. After birth they immediately find their way on to the back of the mother where they are carried about until their first moult is completed.

Though Scorpions are formidable creatures, having few enemies courageous enough to attack them, they are retiring rather than pugnacious in habit. In being hostile to their own kind they tend to justify the old saying that two scorpions will only be found together if mating or if one is eating the other. Theirs is a solitary life and, hiding under stones during the day avoiding the revealing light of the sun, theirs is the night, the silence and the starry sky.

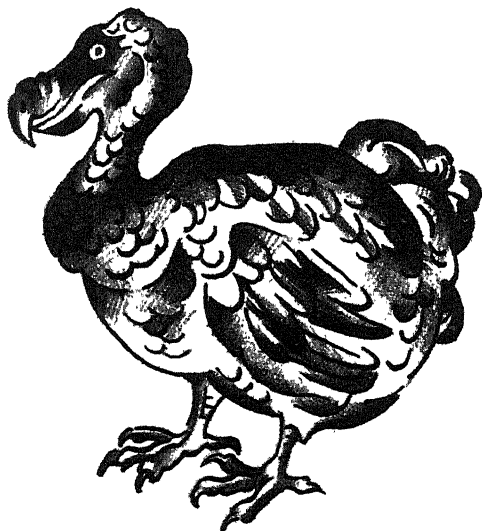
BIRDS THAT CANNOT FLY

THERE are very sound scientific reasons for believing that birds are descended from reptilian stock. In the very early stages of this development the power of flight, as we see it in the birds of today, was probably absent, but we may picture the early ancestors, forced by circumstances and terrestrial enemies to take to the trees, leaping from branch to branch and gradually developing a greater and greater agility in moving about above ground in search of food and to escape the attentions of such other animals as might still be able to harry them.

This mode of life would tend, after generations, to develop certain parts of the body adapted to the new existence until leaping became gliding and so on to flight. It is probable that at one time all birds could fly but some species discarded this faculty for one reason or another; sometimes size and strength, sometimes an aquatic life, sometimes an island home has been the determining factor. Many such species have become extinct mainly because of this inability to fly and so get away from the original habitat when the conditions of security which enabled them to exist without the necessity of flight changed, possibly with the advent of man; they were unable to re-adapt themselves and so perished. The story of Nature is made up of many similar examples.

One such bird was the Dodo, *Didus ineptus*, which became extinct in the seventeenth century. It had been able to find ample food on and in the ground of its island home of Mauritius, had no enemies to molest it and so had no cause to fly. Any part of the body not used for any length of time tends to atrophy and in the course of many generations to disappear; and in the

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DODO

case of the Dodo the lack of the desire to fly became in time a complete inability to fly.

For a very long time the Dodo existed undisturbed, but conditions changed and a new enemy arrived in the form of man, an enemy from which it could not escape by flight. Consequently it was hunted to extinction in the seven-

teenth century not more than a hundred years after it had first been discovered by some Dutch sailors. The tragedy of this strange bird has been immortalized in the expression 'as dead as the Dodo', and in Belloc's verse:

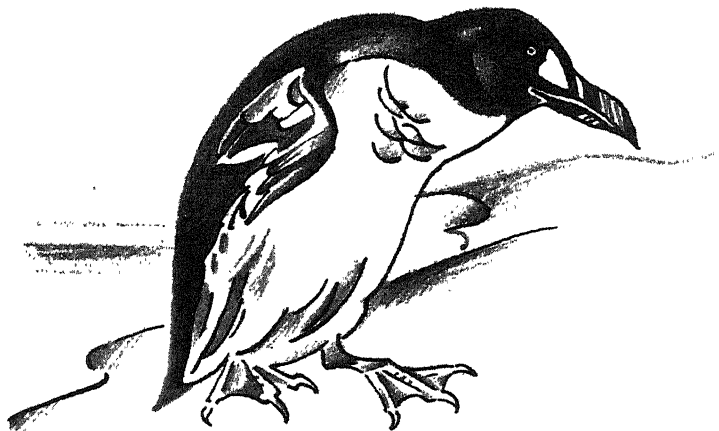
The Dodo used to walk around
And take the sun and air,
The sun yet warms his native ground —
The Dodo is not there!
The voice that used to squawk and squeak
Is now for ever dumb —
Yet you may see his bones and beak
All in the Mu-se-um.

Another flightless bird, now extinct, was the Great Auk, *Alca impennis*, a species related to the Razorbill and the Guillemot. It became extinct about the middle of the nineteenth century but was formerly fairly common on the coasts of Iceland and

BIRDS THAT CANNOT FLY

Newfoundland and was not unknown in British and Scandinavian waters. The Great Auks were used for many purposes by the seamen of the time, for food, for the value of their feathers and, occasionally, for fuel. Both stuffed birds and eggs are greatly prized as rarities nowadays and command fantastic prices. There are a few stuffed birds in museums and at a sale in London six eggs brought prices ranging from one hundred and twenty-five to nearly four hundred pounds each; a mercenary epitaph for the victims of human thoughtlessness!

The Great Auk must have resembled the Penguins in appearance and in habits, although it is doubtful whether it could ever swim as fast as a Penguin, which cuts through the water at great speed. There are many different kinds of Penguins but all belong to the Southern Hemisphere, most of them to the far south, none being found in the Arctic contrary to popular belief. The species from the Antarctic are the largest and the strange fact is that as one goes north so the size decreases, the smallest being found under tropical conditions in the Galapagos Islands.



GREAT AUK

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The Emperor Penguin is the largest species and it may stand over four feet in height. It is found on the Antarctic pack ice near the South Pole. One remarkable fact about it is that it breeds in mid-winter, laying only one egg on the sea-ice itself. Dr. A. E. Wilson, who shared the tragic fate of Scott on that return journey from the South Pole, has told how many of the young are killed from kindness in that a large number of barren birds rush and develop something like a football 'scrimmage' in their anxiety to undertake the task of foster-parents, the unfortunate chick being the ball.

Only one or two Emperor Penguins so far have been brought in captivity to Europe, but at the Washington Zoo in the U.S.A. Dr. Mann was successful in keeping several alive for some months in a specially constructed refrigerator. On the other hand the King Penguin, *Aptenodytes patagonica*, is seen quite often in zoos and, indeed, has been bred in captivity.

Fossil bones of a Penguin which must have been over six feet have been found in New Zealand, but the King Penguin, the second largest species of existing penguins, is only about three feet and weighs about forty pounds.

Penguins spend the greater part of their lives in the sea, coming ashore only to breed and to moult. In the water they move at an incredible speed using their flipper-like wings as paddles and keeping their feet close to the body; it may, in fact, be said that they fly under water. When swimming the eyes are covered by a third eyelid, known as the nictitating membrane, a feature common to many birds.

King Penguins are found on the islands of the Antarctic where it is winter practically all the year round, but they are well protected by the feathers which are set so closely together that water cannot penetrate through the downy undercoat which keeps the bird warm. There is no difference in appearance between the sexes and it is most difficult to distinguish between the male and female. These birds do not build nests and only one egg is laid which takes about fifty days to hatch.



Top: COURTSHIP OF ADELIE PENGUINS

Middle: BABY KING PENGUIN

Bottom: KING PENGUINS QUARRELLING ABOUT THE EGG

CURIOUS CREATURES

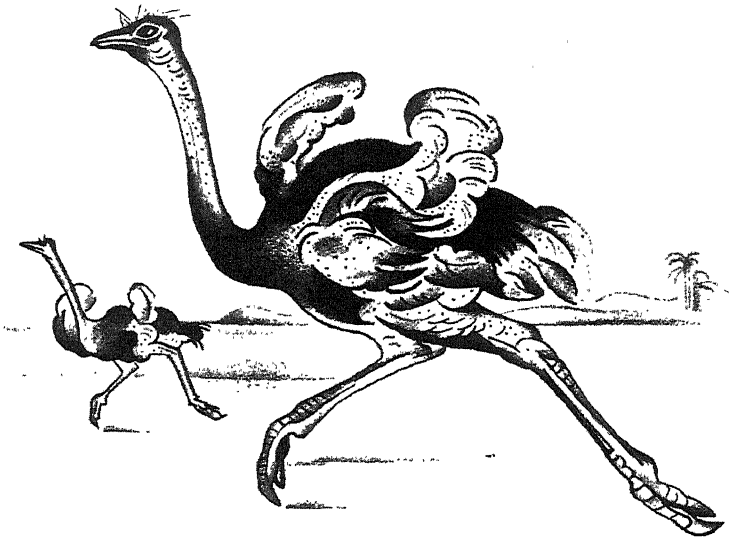
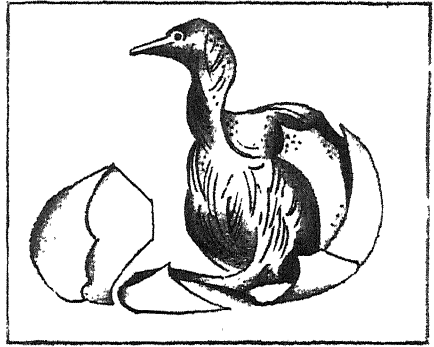
The male and the female take turns in incubating the egg holding it on the well padded, webbed feet covered by a flap of skin — a kind of pouch — to keep it warm. During incubation the penguin usually remains motionless, but it can shuffle along for quite a considerable distance keeping the egg in position on its feet without it coming to any harm. When the egg is transferred from one bird to the other it is done without the egg touching the ground.

The newly-hatched King Penguin chick is practically naked, with a little white down on the head, but within a few days a brownish down grows over the body, rather like a badly-fitted fur coat. The chick is fed by regurgitation, the young bird forcing its head into the beak of the parent until it reaches the throat where the food is transferred. This goes on for about six months until the chick has reached an astonishing size and looks even larger than the parents. At this stage it experiences its first moult after which it is almost indistinguishable from the adult birds and ventures into the water seeking its own food and learning to lead an independent existence.

The Adelie Penguin, *Pygoscelis adeliae*, is also to be found in the Antarctic but is only about half the size of the King Penguin. During courtship penguins make all sorts of play to attract each other. For instance, in the mating season the male Adelie Penguin makes a formal proposal to the female of his choice by standing before her and offering her a stone. If this is accepted the two begin to build their nest or 'scoop' of stones and proceed to raise a family. If on the other hand he is refused then the male crouches meekly with his eyes shut and allows the angry female to peck him until she pauses when he edges up to her, making soft sounds to calm her — after all, he may succeed the next time!

So much for the penguins.

Other flightless birds are those in the group of running or ostrich-like birds which are, in general, found in the Southern Hemisphere, although true ostriches are occasionally to be



AFRICAN OSTRICH

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found north of the equator. This group includes the African Ostriches, *Struthioniformes*, the Rheas or South American Ostriches, *Rheidae*, the Emus, *Dromedidae*, and the Cassowaries, *Casuariidae*, from Australasia. In all of these birds the wings are extremely small and the feathers are soft, having no stiff quills like those of flying birds. The birds have very strong and heavy legs which are used both for running and for defence. They all lay large eggs which, in most cases, are incubated by the male. When the young are hatched they are generally striped, these stripes breaking up the form of the body and helping to camouflage the young birds and so prevent them from being seen by their enemies.

The largest in this group is the North African Ostrich, which is also the largest of all existing birds. A fully grown male stands as high as eight feet and may weigh as much as three hundred-weight. The cock birds are a glossy black and white with ornamental plumes in the tails whereas the hens are smaller and a dull grey in colour. The eggs are very large with thick, creamy-white shells and are good to eat; one egg, weighing nearly three pounds and taking forty minutes to boil hard, will make an omelette sufficient for twelve to fifteen people.

Ostriches are generally found in small groups consisting of one cock bird and three or four hens which all lay their eggs in one nest. This nest is a mere depression in the sand, on which the hen sits by day and the male by night, an interesting illustration of protective coloration, for the grey of the hen blends well with the surroundings by day while the black cock is practically invisible by night. The common saying about the foolish Ostrich 'with his head in the sand' arises from the bird's habit of extending his neck flat along the ground, which is in fact another good aid to concealment when the bird is sitting on the eggs. It was not sufficient, however, to save the birds being hunted for the plumes in the tail of the cock. These feathers were worn by the ancient Egyptians as a sign of justice and in recent years they have been in demand for ornamenta-

BIRDS THAT CANNOT FLY

tion, especially for fans. At one time the South African Ostriches were bred on farms for the value of their plumes but the fact that the fashion has changed has tended to reduce the number of farms and allowed a number of birds to go back to their normal haunts.

The Ostrich has many enemies in addition to man, notably the lion, the cheetah and the hyena which has a great liking for the eggs. As a result the bird is extremely wary, a keen sense of hearing and a keen sight helping it to detect the approach of danger in the desert and open country normally inhabited by Ostriches.

An Ostrich can run as fast as twenty-six miles an hour

and the gradual perfection of its running power has led to a change in the nature of its feet. African Ostriches are rather more specialized in this respect for their toes are reduced to two, one large and the other much smaller. The undersides of these toes are padded, elastic in nature as are those of camels. The energy expended by flying birds in flight is concentrated in the case of the Ostrich in its running and its powerful legs are capable of a tremendously powerful kick forward which is comparable with the proverbial kick of the mule in its effect.

The Rhea is only half the size of the African Ostrich. It is a three-toed bird and while the wings, which are fairly well-developed and covered with long, slender plumes, are useless



RHEA OR SOUTH AMERICAN
OSTRICH

CURIOUS CREATURES

for flight they can be used as sails before the wind to aid its running. Rheas exist on the pampas of South America and feed on grass and other vegetation. Strangely enough they are reputed to be good swimmers.

Emus and Cassowaries are long-necked three-toed birds with greatly reduced wings and no tails. Emus are to be found only in Australia, living on the plains and in open wooded country. They, too, are swift runners with a great power of endurance and can defend themselves with formidable kicks, striking outward and backward.

The Cassowary would assuredly win any beauty competition for running birds for the shiny, blue-black, hairy plumage of the body contrasts strikingly with the bare skin of the neck and head, coloured in bright blue, red and green, a colour scheme common to both sexes. Its head is capped with

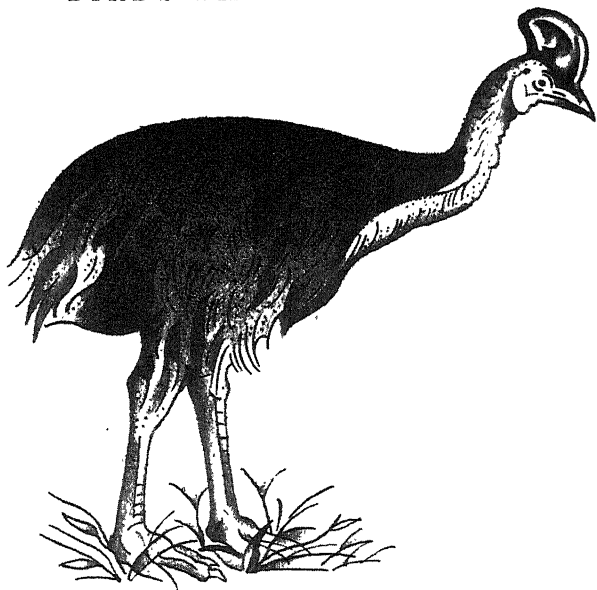


EMU AND HER YOUNG

a huge bony casque or helmet which undoubtedly acts as a protection when the bird is moving in heavy bush. The Cassowary is dependent entirely upon its strong swift legs, often leaping high obstacles, but it has a very pugnacious nature and the males are equipped with a huge nail on the inner toe which can inflict considerable damage when the bird lands a vicious kick, the foot being brought forward and downward.

The smallest of this group of running birds is

BIRDS THAT CANNOT FLY



CASSOWARY

the Kiwi, *Apteryx australis*, which presents a striking contrast in size to those we have already mentioned. Not only is it flightless but it lacks visible wings. The tailless body is covered with a thick mat of hair-like feathers and this, together with the long beak, small head and stocky legs set far back, gives the Kiwi a singularly strange appearance. The female is about the same size as our domestic fowl but the male is much smaller. The huge egg, however, is out of all proportion to the size of the bird, being about five inches long and three inches in diameter, almost a quarter of the size of the Kiwi itself. The illustration on p. 232 shows the comparative sizes of the Kiwi's egg and the ordinary domestic hen's egg. One egg, laid by a Kiwi in the London Zoological Gardens on Easter Sunday 1914, weighed eleven and a half ounces against the two and a half ounces of the average hen's egg.

CURIOUS CREATURES



KIWI

In its search for food, chiefly worms and other earth insects, the Kiwi moves slowly and cautiously mainly by night. The small weak eyes are practically useless but, unlike other birds, the Kiwi has extremely acute senses of hearing and smell which play an important part in its existence. So acute indeed is the Kiwi's sense of smell that it can locate worms underground

BIRDS THAT CANNOT FLY

before driving its bill into the earth. Another unusual feature is the fact that the nostrils are to be found at the tip of the beak whereas with other birds they are at or near the base. A native of New Zealand it has been so hunted by men and dogs that today this unfortunate creature, one of the most curious and harmless, is in danger of becoming extinct.

The natural absence of predatory mammals in the islands of New Zealand has caused other birds to become lazy and so lose the power of flight. One of these, the Kakapo or Owl Parrot, *Strigops habroptilus*, lives in holes among roots of trees, is mainly nocturnal in its habits, is rarely seen and feeds on grass, seeds, berries and roots. Its olive-green feathers were used by Maoris for adornment. Almost two feet in length, it is one of the largest species of parrots, but the introduction of domestic cats into New Zealand has brought about such a reduction in the numbers that here again there is a danger of the species becoming extinct.



KAKAPO OR OWL PARROT OF NEW ZEALAND

CURIOUS CREATURES



STEAMER DUCK AND ITS YOUNG

It may well be that the future will produce more types of flightless birds and it is probable that some of these will be found among the duck family, *Anatidae*, for aquatic forms are less exposed to attack than those which live on the land. Many members of this family, such as the surface-feeding ducks, do lose the power of flight for a part of the year for the wing quills are all shed at the same time, but they conceal themselves with great skill whilst in this comparatively helpless condition. One species, the Steamer Duck, *Tachyreres cinereus*, is unique insofar as it can fly when young but cannot do so when adult. It is clumsy, a heavily-built bird, nearly as large as a goose and a native of the Falkland Islands and the Straits of Magellan. The

BIRDS THAT CANNOT FLY

plumage is a dull grey, the bill and feet a bright orange. The name is derived from the fact that the adult birds, being too heavy for their wings, are unable to fly and when they try they can only flap along the surface of the water using the wings as paddles.

One final word on flightless birds. Legend has it that an ancestor of the Ostriches, the extinct flightless *Aepyornis* or Roc from Madagascar, could not nest in trees, since none were high enough, and reared its young on a diet of elephants!

CHAPTER XIV

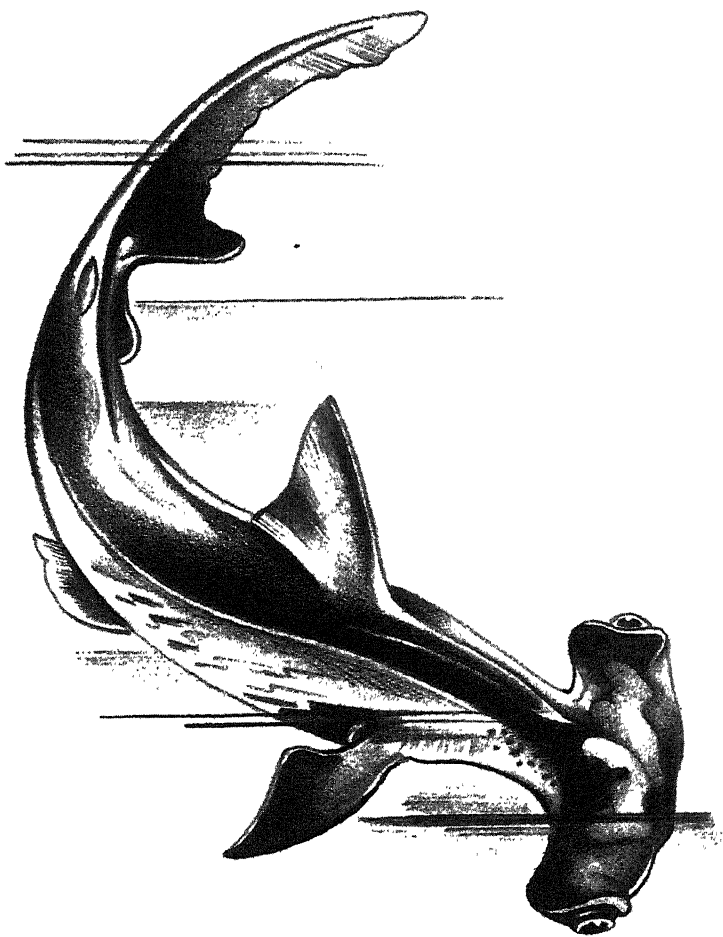
A PARADE OF CURIOSITIES

THAT Nature knows no bounds in her invention of forms within the animal kingdom is the conclusion at which we must arrive when we consider the phenomenon of numerous fantastically-shaped creatures. Although there is usually a very good reason for the apparent oddity or incongruity with which Nature has seen fit to clothe her offspring, it is not always possible for us, limited as we are in thought and understanding, to see in every case the reason for that oddity or incongruity. After all, we must accept the fact that there is no actual standard by which we can judge the ungainly and the grotesque: nevertheless there are some animals which do appear so bizarre by almost any standard that we might be justified in collecting a few of them into 'a parade of curiosities'.

If we begin with life in the sea, certainly one of the most outstanding and most extraordinary-looking creatures is the Hammerhead, *Sphyrna zygaena*, which, with its grotesque deformity and ferocious appetite, must rank high among the real monsters of the sea.

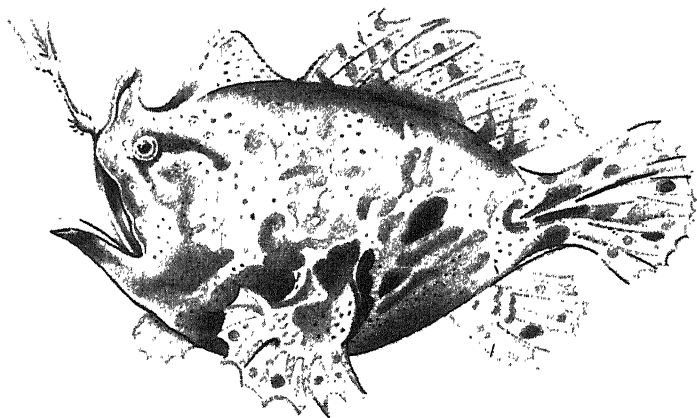
These sharks are commonly found in the deep waters of the Indian Ocean, although in rare instances a straggler may wander into British waters. They reach a size of about sixteen feet in length, and they are reported to feed even on the deadly Sting Ray, being seemingly indifferent to wounds from the spines and poisonous stings of this powerful adversary. In fact, one specimen, which had been feeding on one of these rays, was afterwards captured and no less than fifty barbed tail-spines of the Sting Ray were found embedded in its mouth.

Monstrous is a word that can truly be applied to the Hammer-headed Shark, for the front part of the head, which is broad and



HAMMER HEAD

CURIOUS CREATURES



ANTENARIUS OF THE INDIAN OCEAN

flattened, projects on either side in a cylindrical form with a gleaming yellow eye on each extremity. Beneath this huge mallet-like head is the mouth with its long oblique teeth emphasizing the ferocity of this dull abomination. Just what bearing this mis-shapen type of head has on the activities of the fish is a problem not yet solved.

Mere size is not always an attribute necessary for awkwardness and ferocity. Some of the smaller fishes are just as terrifying as the larger ones. One of these miniature monsters is the Antenarius of the Indian Ocean, which is only a few inches long. Short-bodied and sluggish, with the mouth slanting almost vertically, this fish is a feeble swimmer and probably uses its arm-like fins to climb about in the seaweed. The most attractive feature of the fish is the slender movable rod with a 'bait' on the tip which is suspended over the mouth and which the little angler uses to lure its prey. This line and bait is, in fact, a modification of the first dorsal fin.

Dr. W. Beebe, observing the habits of the Antenarius in an aquarium containing other fish, saw the victims approaching the 'bait' which was wriggling like a worm. When they were still

A PARADISE OF CURIOSITIES

two inches away from the angler's protruding lower jaw, the mouth opened and they disappeared before Beebe's eyes could follow the event. 'We imagined a gleam of satisfaction in the fishy eye' is all that he could say with certainty.

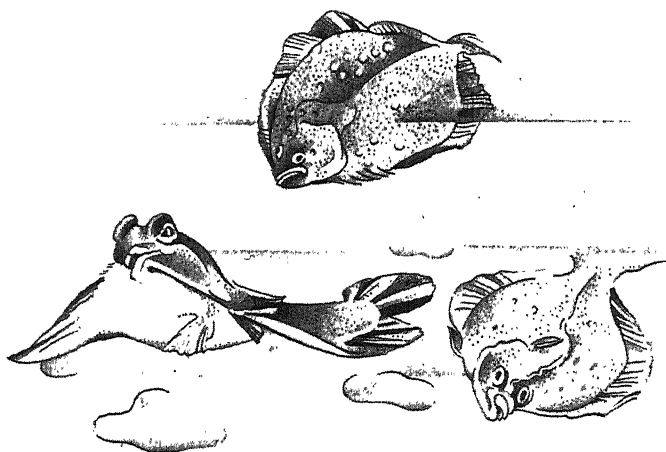
In colour and marking the *Antenarius* matches its surroundings, which gives the angler good protection both for avoiding its enemies and for stalking its prey.

Another strange little fish is the Dragon Fish or Sea Moth of which the species *Pegasus chiropterus* of Sumatra is illustrated. The *Pegasidae* are a family of peculiar little fishes not related with certainty to any other. They rarely exceed four inches in



DRAGON FISH

CURIOUS CREATURES



FLAT FISH

Top: TURBOT Bottom Left: STARRY FLOUNDER Bottom Right: PLAICE

length and are found in the Indian, Chinese and Japanese seas where, curiously enough, they do not use their enlarged wing-like fins for gliding, but are often seen drifting with the currents. Their bodies are covered with movable bony plates while the pectoral fins are long, horizontal, and composed of single rays.

Everyone must have noticed the wry countenances of Flat Fishes on the fishmonger's slab, but probably not everyone is aware of the extraordinary story behind the shape of those peculiar faces.

There are about five hundred different kinds of Flat Fish found in all the seas of the world, of which the Halibut, the Sole, the Turbot, the Flounder and the Plaice are the most commonly known. Whatever their names, however, they all show a certain similarity in appearance and any one of them is easily recognizable as a Flat Fish.

The eggs of Flat Fishes are numerous; a Turbot may lay as many as fourteen million which, floating on the surface of the

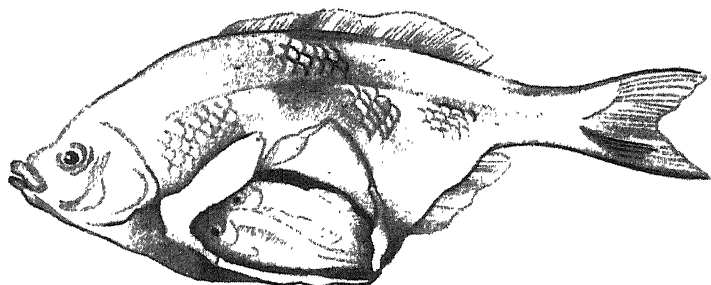
A PARADISE OF CURIOSITIES

water, hatch in about a week. When the young Flat Fishes emerge they are perfectly symmetrical, having an eye on each side of the head like any ordinary fish. During the early stages of life they swim at the surface, feeding on minute organisms. After a month or so they reach a length of about half an inch and sink to the bottom where they lean more and more to one side until their position is flat. At the same time, with the alteration of the normal fish-shape, one eye migrates from underneath over the roof of the head close to the other. Whilst the upper surface with the eyes becomes coloured and harmonizes with the surrounding sea floor, the blind undersurface of the body becomes a silvery white. The actual back and the belly bear the fins surrounding the body like a fringe.

Living mainly on the sea floor, the Flat Fish buries itself completely in the sand, leaving nothing projecting but the eyes with the thick and scaly eyelids. Thus buried it is difficult to detect a resting Flat Fish even in an aquarium. In addition most of the Flat Fishes have the ability to change their colouring to harmonize with their surroundings. A striking example of such colour adjustment has been observed by placing a Flounder in a chessboard-patterned tank; after a while the fish showed a passable imitation of the black and white design. The stimulus for this change must be visual since a blind fish would not change colour.

The more the Flat Fishes have become accustomed to life on the sea floor, the more has their symmetry been affected. In general a given species will always lie on the same side; the Plaice, for example, normally has the eyes and the colour on the right side, but reversed specimens do occasionally turn up. The mouth of the Plaice is awry like its eyes and face generally, but this slanted mouth is of considerable use to the fish which, lying flat on the ground, has to pick up its food from the sea bed. In the case of the Halibut, which, in contrast to the Plaice, is an active swimmer after its prey, the jaws are more equally developed.

CURIOUS CREATURES



DITREMA TEMMINKII

There are, of course, many other differences among the various species of Flat Fish, but they all serve to underline the curiosity of their appearance and the peculiarity of their habits.

The last of the fishes in this parade belongs to the North Pacific Surf Fishes, *Embiotocidae*, members of which bring forth their young alive. The fertilized eggs of these fishes undergo their development in the body of the female, and the number of young produced at a single birth varies considerably from three to forty, dependent on the size of the specimen. The illustration of *Ditrema temminkii*, of the Northern Pacific, shows a sectional view with the embryos already in an advanced stage. Though in no way spectacular in appearance, this fish certainly deserves, if only for its mammalian trait, to be placed among the curiosities.

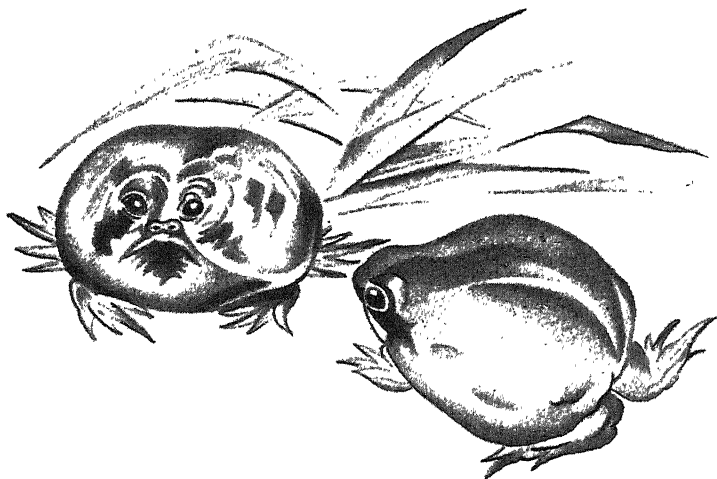
Passing to the reptiles and amphibians, one is struck by the exceeding plumpness of the body of the Short-Headed Frog, *Breviceps mossambicus*, which makes it one of the peculiar representatives of its class. Indeed, when it has puffed out its body to the fullest extent, this creature resembles an indiarubber ball more than a frog. About three to four inches long, these frogs are found only in tropical and subtropical Africa. Their smooth skin is of a brown or blackish hue with a dark oblique streak below the eye. The narrow, toothless mouth and the long tongue tend to indicate that they probably feed on white ants.

A PARADISE OF CURIOSITIES

I well remember seeing, after a heavy rainfall in Mozambique, numbers of these bullet-headed creatures which disappeared almost as quickly as they had suddenly appeared. They are able to dig themselves into the ground very quickly by means of a sharp, shovel-like organ on their hind feet, and it is believed that they lead a mole-like existence. In their movements on the ground they are rather slow, not hopping like ordinary frogs.

It is a long jump from the African Short-Headed Frog to the South American Water Tortoise, *Hydromedusa tectifera*, which lives in the lakes and rivers of Brazil and Argentine, and which very seldom leaves the water. It reaches a size of about eighteen inches in length and differs from other turtles and tortoises in that the neck when drawn into the cavity of the shell, is not flexed in the form of a letter S but simply bends sideways along the outer part of the body. Living in the water as it does, *Hydromedusa* is a skilled swimmer and feeds almost exclusively on fish.

For some reason reptiles have always aroused curiosity and



SHORT-HEADED FROG OF MOZAMBIQUE



SNAKE-NECKED WATER TORTOISE OF SOUTH AMERICA

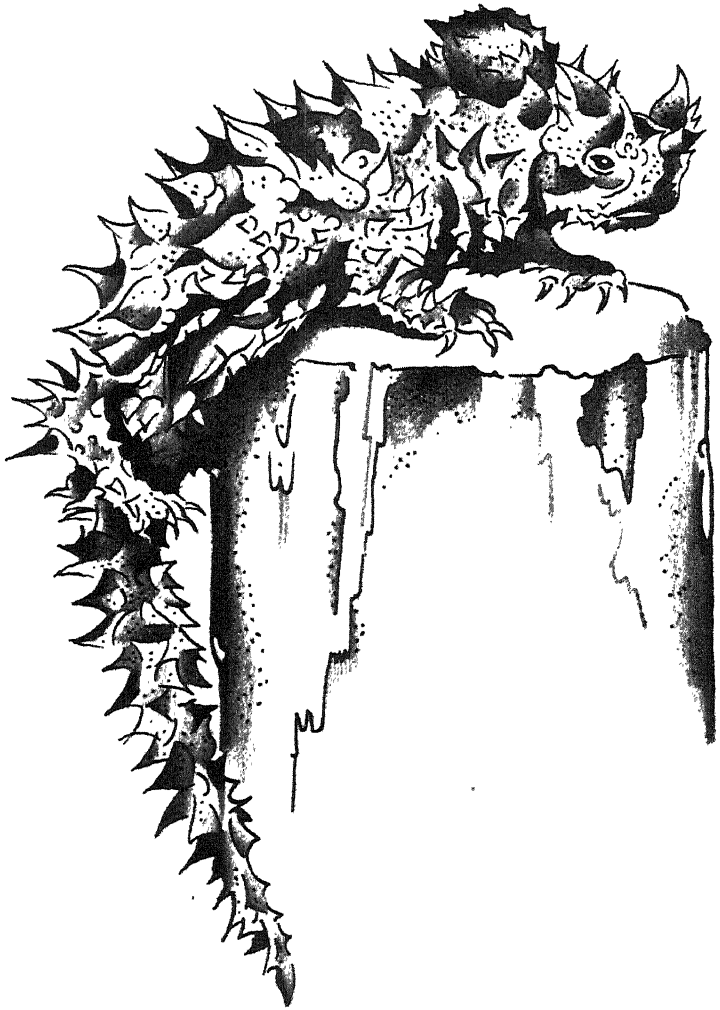
A PARADISE OF CURIOSITIES

fear. Without deserving it they have been credited with all sorts of evil habits which in fact exist only in human imagination. Mostly quite harmless, it is probably their extraordinary appearance which has given rise to myth and legend and has led, moreover, to their being given awe-inspiring names.

Denizens of the arid interior of Australia are the Mountain Devils or Horned Dragons, *Moloch horridus*, which, in spite of their name and their spiky bodies about eight inches long, are not only harmless in behaviour but are even highly praised for their insect-destroying activities. The natural food of these singular reptiles consists exclusively of ants, but only the small, black, evil-smelling variety which often prove themselves pests by invading houses. The lizards pick up these ants by flicking out the adhesive tongue with a rapid flash-like movement. Interesting details about their appetite are given by H. W. Davey who kept two Mountain Devils in captivity: 'The average number of ants consumed per minute by a Moloch is forty-five, providing that the day is hot and ants are plentiful, so that for a meal lasting for fifteen minutes (which is about the usual time they take to fill themselves) it amounts to a total of 675 ants. This, at only two meals per day, gives 1350 ants per Moloch.'

Mountain Devils normally frequent rainless countries and they have never been seen drinking, not even in captivity. Their skin is hygroscopic, absorbing moisture like blotting-paper, so that whenever dew falls, or even the slightest rain, they crawl on to dampened leaves or grass and quench their thirst in this extraordinary way. It is said that sometimes these brown, yellow and chestnut coloured lizards walk erect with their tails held high.

The name Basilisk, once applied by the ancient Greeks and Romans to a fabulous, fire-breathing monster, is borne nowadays by a perfectly harmless although formidable looking member of the genus *Basiliscus*. The illustration shows the male of the green Helmet Basilisk, *Basiliscus americanus*, with his large, elaborate, cock-comb-like crest on the hind part of the head



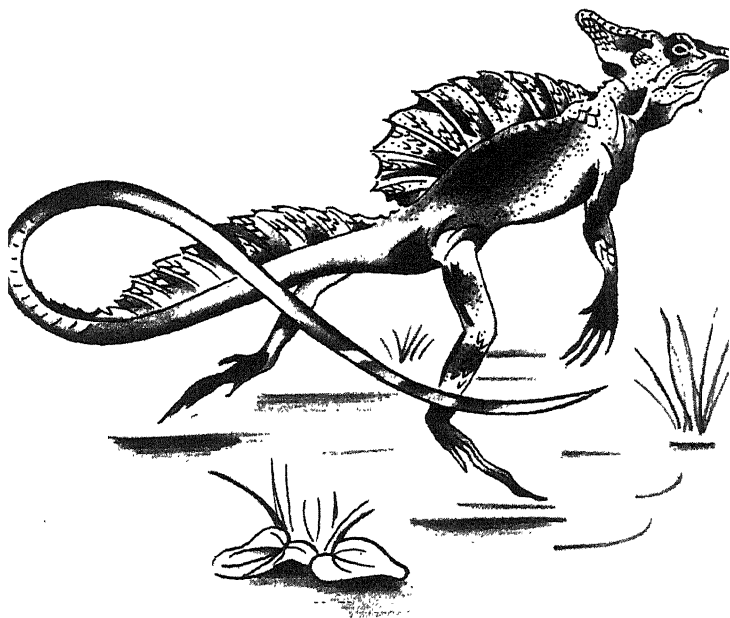
THE AUSTRALIAN MOUNTAIN DEVIL OR MOLOCH HORRIDUS

A PARADISE OF CURIOSITIES

which can be inflated and deflated, while a high crest running along the back can be raised and lowered at will. Another jagged-edged crest adorns the tail.

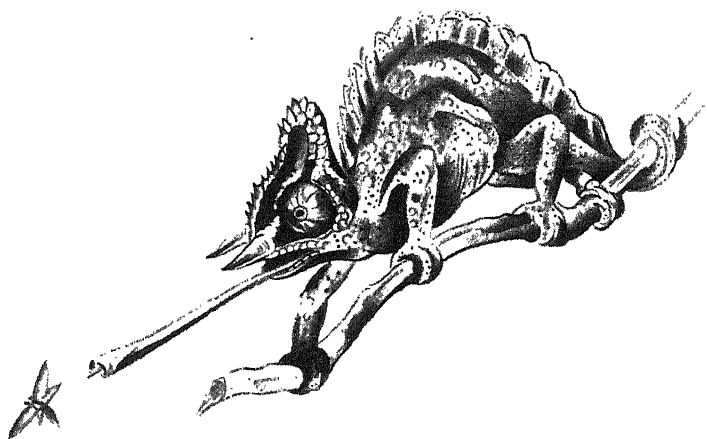
Basilisks are tree-dwelling lizards which feed on insects. Resting well hidden during the day on branches overhanging the water, they alert at the slightest sound and throw themselves into the water, swimming fast using the long tail as a rudder. But Basilisks can also run with extreme rapidity on their hind legs. The toes of the hind feet have broad fringes of long scales which enable the creatures to dash in an upright position even over the surface of the water or over soft sand.

One of the important features in which Chameleons differ from lizards is the parrot-like structure of their feet. The toes



BASILISK

CURIOUS CREATURES



AFRICAN MOUNTAIN CHAMELEON

of the Chameleons are divided into two branches, thus forming grasping organs of great power. Another, perhaps greater, peculiarity is the eyes. These are formed like globes and are covered by a thick granular lid in the centre of which is a minute perforation for the pupil. Due to the independent relationship of the two eyes, the Chameleon can fix one eye on an object in front while the other may be searching around for a second victim. The extraordinary development of the long worm-like tongue, adapted for the special purpose of catching flies, is certainly yet another important structural peculiarity. This tongue can be shot out with lightning rapidity to a distance equal to the length of its owner's body and rarely misses its target. The tip is club-shaped and highly adhesive; the shaft is cylindrical and elastic, like indiarubber in texture.

The colour-changing activities of the Chameleon have often been described, but we have seen in previous chapters of this book that other creatures can undergo colour changes as well as the Chameleon, some of them even quicker. Nevertheless it must be admitted that Chameleons do possess this faculty to a

A PARADISE OF CURIOSITIES

striking degree and can even assume a decorative pattern to render themselves less conspicuous within their surroundings.

There are about fifty different species of Chameleons of which the largest is about fifteen inches and the smallest, the Dwarf of Madagascar, scarcely more than two and a half inches. That shown in the illustration is the African Mountain Chameleon, *Chameleon montium*, which is depicted grasping with its prehensile tail the branch of a tree in which it spends most of its life. Like other members of the reptile world it displays a heavy armament, but these huge horn-like projections are of negligible use either for aggression or for defence and have just to be included with the many other features of structure which still remain unexplained.

This enigma also applies to the most unusual-looking White Headed Bell Bird, *Procnias tricarunculatas*, with its three wattles. When Staff Collector Charles Cordier arrived at the Zoological Park in New York from Costa Rica on August 31st, 1947, he brought with him three specimens of these queer creatures. It is believed that these, a male, a female and an immature bird, were the first representatives of the Three Wattled Bell Bird to be seen alive outside their native haunts.

Unfortunately the adult male bird escaped soon after arrival, but Mr. Cordier had studied the bird's habits in its native surroundings. He writes: 'It was a great thrill to hold a male



WHITE HEADED BELL BIRD

CURIOUS CREATURES

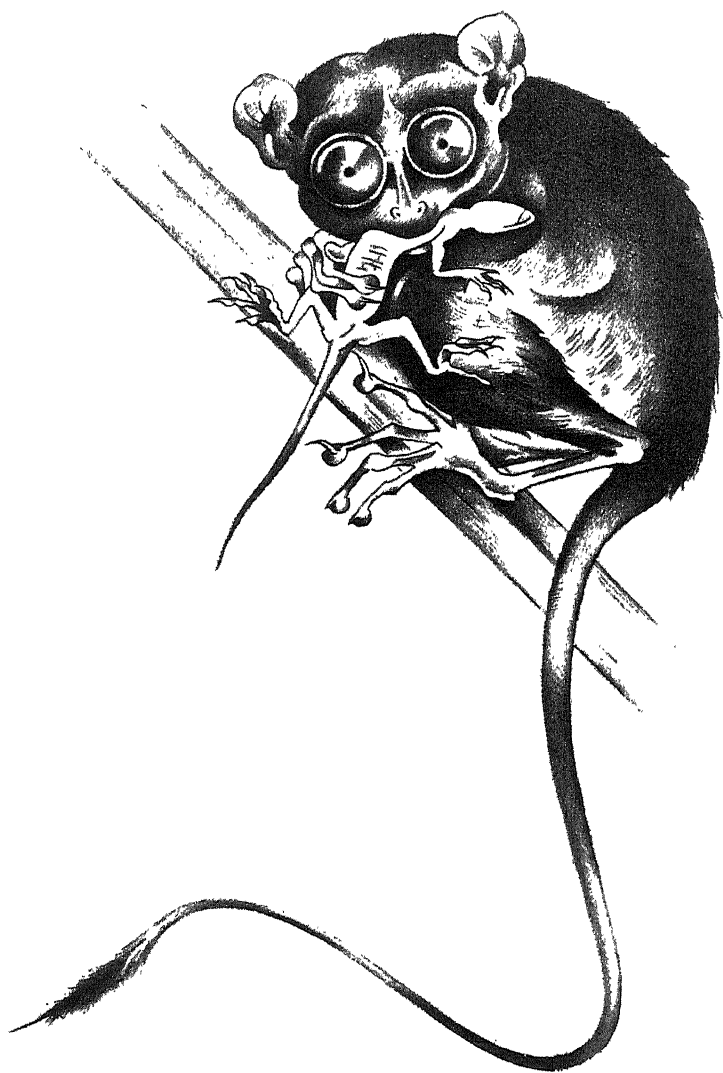
of the Three Wattled Bell Bird in my hand and to examine it closely. Like everyone else, I puzzled over the fleshy wattles, one on each side of the mouth and one on the forehead. During courtship period these grow to a length of a good two inches and they seem to get in the bird's way; the male is often seen throwing them back with a head-tossing motion like a girl shaking back her long hair. The wattles never inflate and do not stick rigidly out and upward, as I have seen them depicted in old books of Natural History.' Mr. Cordier also states that in contrast to the Brazilian Bell Birds, which are famous for their 'ringing call' the Three Wattled Bell Bird makes only a noise that is part squawk and part bark.

The head and neck of the illustrated bird are white, the rest of the body is a chestnut brown.

From the infinite variety of mammals of strange appearance the Tarsier, *Tarsius spectrum*, has recently created an even greater sensation than the Three Wattled Bell Bird. It had never before been seen alive in Europe and the arrival of several specimens in the zoos of America and London resulted in a world-wide interest in these strange little creatures.

The animal, a small primitive primate, is exceedingly specialized in its mode of life. It developed from the same stock as that which gave rise to the monkeys and the higher primates, primates being the name given by zoologists to the group of mammals which includes man, apes, monkeys and lemurs. The Tarsier is one of the very early types, a remarkable survivor who has come down to us more or less unchanged. Fossil bones of Tarsiers of the Eocene period some fifty million years ago have been discovered in the rocks of Southern California and in Wyoming.

Today the nocturnal Tarsiers inhabit certain forests in South East Asia and the Phillipines. Most of the modest length is made up of tail; a large Tarsier measures only some five inches from the nose to the base of its tail, but the tail is about ten inches long. The furry coat is a reddish brown colour and



TARSIER

CURIOUS CREATURES

the large leathery ears can be folded to prevent injury. Fingers and toes are long and thin and the tips are furnished with disc-like pads which are used for obtaining a firm grip on the slippery branches of trees. The second and third toes of each foot bear long, sharp claws while the others have smaller nails. The most fascinating feature, perhaps, is the huge staring eyes. They are, in proportion to the dwarf-like size of the delicate Tarsier, the largest in any mammal. Only slightly movable in their sockets, the Tarsier has to turn its head like an owl to inspect anything to the left or the right.

After describing the Tarsier's appearance one must make reference to Charles Heizer Wharton, the young American zoologist, who, in 1947, succeeded in collecting several of these animals in Mindanao and flying them safely to the United States. Wharton completed this hunt with the help of natives. Spotting the location of the Tarsier during the day-time by their strong and heavy odour, they shook the sleeping creatures from the trees on to the ground where they seemed to be an easy catch. A number of curious peculiarities of the Tarsiers were observed by Wharton in their native haunts. He saw at night the animals leave their hide-out in the top of the trees and after a series of long and rapid hops they propelled their three-ounce bodies across gaps of six feet between the trees. They sailed through the air with ears extended, hands and feet drawn up and tail trailing behind. An instant before landing they swing the rat-like tail upwards and push the long hind legs forward, thus breaking the impact on landing.

In spring, Wharton tells us, the Tarsier utters a series of locust chirps. He also gives a vivid account of the amazing appetite of these animals which, in captivity, consumed about ten grasshoppers or five lizards apiece daily. The successful naturalist, faced with the task of feeding a hundred hungry Tarsiers, which watched him with two hundred big brown eyes, resorted to offering them raw meat and crustaceans since he had not the necessary supplies of grasshoppers, and these, to

A PARADISE OF CURIOSITIES

his immense relief, were accepted. In the wild state Tarsiers subsist on insects, lizards and, very likely, mice. Besides their singular and most peculiar achievements these fragile creatures, these almost 'living fossils', can also claim to rank among the most carnivorous of the primates.

To end our parade let us have a look at a curious association of animals of quite different species. As shown in the illustration a bat has not hesitated to choose the formidable and greedy American Bullfrog as a resting place. This is certainly a most unusual combination of two dissimilar creatures, and one which could perhaps lead to the conclusion that hostility is not always the law of Nature. However, behaviour, like structure, presents many different and speculative features which often appear to the uncomprehending humans nothing more than mysterious phenomena of Nature and which remain unanswered riddles exciting our curiosity.



A BAT USING A BULL FROG AS A RESTING PLACE

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